DRAFT

Stormwater Pump Station Diversions Feasibility Evaluation

Prepared for

Bay Area Stormwater Management Agencies Association (BASMAA)

Oakland, California

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September 13, 2010

BC Job # 139444

This is a draft and is not intended to be a final representation
of the work done or recommendations made by Brown and Caldwell.
It should not be relied upon; consult the final report.

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List of Abbreviations

BASMAA	Bay Area Stormwater Management Agencies Association
CW4CB	Clean Watersheds for a Clean Bay
FER	Feasibility Evaluation Report
GIS	geographic information systems
gpm	gallons per minute
HMP	hydromodification management plans
LID	Low Impact Development
mgd	million gallons per day
MPC	Monitoring and Pollutants of Concern
MS4s	municipal separate storm sewer systems
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PCBs	polychlorinated biphenyls
POTWs	publicly owned treatment works
PPDG	Project Planning and Design Guide
ROW	Right-of-way
SCADA	Supervisory control and data acquisition
SFEI	San Francisco Estuary Institute
SFB-RWQCB	San Francisco Bay Regional Water Quality Control Board
the Bay	San Francisco Bay
TMDL	Total Maximum Daily Load
TOC	Technical Oversight Committee
WLAs	Wasteload allocations

Executive Summary

This Feasibility Evaluation Report (FER) fulfills reporting requirements for Fiscal Year 2009/10 under provisions C.11.f and C.12.f of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (Order No R2-2009-0074), more commonly referred to as the Municipal Regional Permit (MRP). Provisions C.11.f and C.12.f of the MRP are nearly identical provisions for control of mercury (C.11) and polychlorinated biphenyls (PCBs) (C.12) that require the evaluation of pilot diversions to publicly owned treatment works (POTWs) of dry weather urban runoff and/or first flush events from stormwater pump stations. The pilot projects are being evaluated in parallel with other BMP pilot implementation projects, including stormwater treatment retrofits, sediment management pilot projects, and source investigations to identify contaminated sites. The first product required under these provisions is a feasibility evaluation to be included in the 2010 Annual Reports for each Permittee. The feasibility evaluation is to include, but is not limited to, costs, and impacts on the stormwater and wastewater agencies and benefits to the receiving waters that would result from pilot projects that divert and treat dry weather runoff and first flush flows. The 2010 Annual Report is to summarize the feasibility evaluation, including:

- Selection criteria leading to the identification of five candidate and five alternate pump stations;
- Time schedules for conducting pilot studies; and
- A proposed method for distributing mercury and PCBs load reductions to participating wastewater and stormwater agencies..

Selection criteria have been developed based on a review of other programs that have scoped and/or implemented urban runoff diversion projects and discussions with stormwater program representatives. The Selection criteria are intended to inform the selection of sites (i.e., pump stations) for potential diversion and framed around water quality needs, the broader regional context of pilot-testing a variety of pollutant control strategies in the Bay Area, and acceptability, as summarized in Table ES-1 below.

Maps of PCB concentrations in sediments, pump station locations, and POTW service areas are included in this report to assist with the needs criterion. Guidance is also provided for addressing the acceptability criteria. Tools for developing cost estimates and estimating potential load reductions of PCBs and Hg from stormwater discharges as a result of pilot diversion projects are also included.

Table ES-1. Proposed Selection Criteria and Information Needed

Criteria		Information Needed
Needs	Will the project yield a significant PCB load reduction?	PCB concentrations in sediments from the local drainage; Pump station inventories in GIS and tabular formats Event-mean PCB concentrations in stormwater; TSS and flow measurements; Drainage area assessments
	Will the project provide unique or new information?	Peer review from Technical Oversight Committee
	Does a pilot project fit into the broader regional context of pilot-testing a range of pollutant control strategies, including pollution prevention, site remediations, enhanced sediment management, and stormwater treatment retrofitting strategies?	Peer review from Technical Oversight Committee
Costs and Alternatives	Are the capital and operation and maintenance costs associated with diversion prohibitive?	Site investigations Conceptual designs and drawings Preliminary site-specific cost estimates Treatment and connection costs/charges.
	Are there ways to control upstream sources of PCBs through remediation, removal, isolation, or run-on diversion?	Source identification studies Peer review from Technical Oversight Group
	Can onsite treatment or infiltration retrofits be implemented?	Site investigations, including right-of-way mapping
Acceptability	Is there an accessible POTW willing and able to provide treatment service?	POTW service area map Communication with POTW managers
	Can the pilot diversion be sited within acceptable design criteria?	Pre-design checklist assessment (Table 1)

The cost and load estimating tools were applied to three hypothetical scenarios: a constructed pilot diversion, a temporary pilot diversion, and a strategic conveyance system cleanout pilot project. The constructed pilot diversion scenario resulted in an estimated PCB load reduction of 1.6 grams per year discharged to the Bay at a one-time cost of $750,000; over twenty years this would reduce 32 grams of PCBs at a cost of $23,500 per gram of PCBs removed; the cost per gram would increase if the hypothetical pilot diversion were to be terminated in less than twenty years. The temporary pilot diversion scenario resulted in an estimated one-time load reduction of 0.11 grams discharged to the Bay, at a cost of $180,000, or $1,600,000 per gram of PCBs removed in total. The strategic conveyance system cleanout scenario resulted in an estimated one-time load reduction of 0.095 grams of PCBs per year, at a cost of $28,000, or $300,000 per gram of PCBs removed in total. All three of these scenarios represent fractionally small (0.0006 to 0.008 percent) amounts of the total estimated stormwater PCB load currently discharged to the Bay (20 kg). Those hypothetical costs all reflect the simplifying assumption that the receiving POTW waives treament fees.

The simplifying assumption that a POTW waives treatment fees is, in fact, unlikely. In most cases, wastewater and stormwater programs are funded through separate sources, and so institutional factors may make such a waiver problematic. Connection fees typically range from $9,000 to $18,000 per thousand gallons per day, and treatment fees typically range from $300 to $2,400 per MG treated. As a result, these cost estimates for the hypothetical scenarios are llikely underestimated. Other charges may also be assessed, such as East Bay MUD's "wastewater capacity fee" of at least $97.40 per 100 cubic feet per month, or $130,000/MG/month.

The report concludes with a proposed approach to distribute credit for load reductions to participating stormwater programs and POTWs, and a proposed preliminary schedule for pilot project implementation.

Section 1

Background

This Feasibility Evaluation Report (FER) fulfills reporting requirements for Fiscal Year 2009/10 under provisions C.11.f and C.12.f of the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (Order No R2-2009-0074), more commonly referred to as the Municipal Regional Permit (MRP). Provisions C.11.f and C.12.f of the MRP are nearly identical provisions for control of mercury (C.11) and polychlorinated biphenyls (PCBs) (C.12) that require the evaluation of pilot diversions to publicly owned treatment works (POTWs) of dry weather urban runoff and/or first flush events from stormwater pump stations. The pilot projects are being evaluated in parallel with other BMP pilot implementation projects, including stormwater treatment retrofits, sediment management pilot projects, and source investigations to identify contaminated sites. The first product required under these provisions is a feasibility evaluation to be included in the 2010 Annual Reports for each Permittee. The feasibility evaluation is to include, but is not limited to, costs, and impacts on the stormwater and wastewater agencies and benefits to the receiving waters that would result from pilot projects that divert and treat dry weather runoff and first flush flows. The 2010 Annual Report is to summarize the feasibility evaluation, including:

- Selection criteria leading to the identification of five candidate and five alternate pump stations;
- Time schedules for conducting pilot studies; and
- A proposed method for distributing mercury and PCBs load reductions to participating wastewater and stormwater agencies.

The data sources, computational tools, and recommendations of this report are intended to guide municipal Permittees in the selection and scoping of stormwater pilot diversion pilot projects. This section presents a brief overview of the problem statement and planning context of the pilot diversion concept. The second section summarizes the approach to develop this Feasibility Evaluation Report (FER). The third section summarizes the findings in regard to:

- Selection criteria to inform site selection
- Cost/benefit analysis of three example scenarios
- A framework for crediting load reductions attained
- Information tools available
- Opportunities and constraints

The fourth section of the report briefly summarizes for Permittees how the tools in this report can be used to scope out candidate pump station pilot diversion projects. The report concludes with a proposed preliminary schedule for selection of candidate pump stations and development and implementation of pilot project studies.

1.1 Problem Statement

Bay Area storm water dischargers have been required to implement significant reductions in the annual loads of mercury and polychlorinated biphenyls (PCBs) discharged to San Francisco Bay (the Bay) from areas served by municipal separate storm sewer systems (MS4s). The requirements have been established as wasteload allocations (WLAs) in the Total Maximum Daily Load (TMDL) plans for mercury and PCBs in the Bay adopted by the San Francisco Bay Regional Water Quality Control Board

(SFB-RWQCB 2006; SFB-RWQCB, 2008). The mercury TMDL requires a two-fold reduction in the annual average mass of mercury discharged from urban stormwater, from the current estimated load of 160 kg/yr down to 82 kg/yr by the year 2026. The PCBs TMDL requires approximately a tenfold reduction in the annual average mass of PCBs discharged from all stormwater[1] (i.e., urban and non-urban), from 20 kg/yr down to 2 kg/yr by the year 2028.

Those numeric load reduction targets are important to keep in mind when evaluating the load reduction benefit of any specific pilot project and comparing to other alternatives for PCB load reduction. They also show that PCB load reduction is the driver for planning control measure implementation, because the reductions required are larger than those of mercury. For this reason, SFB-RWQCB staff has guided Bay Area Stormwater Management Agencies Association (BASMAA) members to plan pilot projects with a focus on PCB load reductions, and report the mercury load reductions attained by those same pilots. Following that guidance, this FER focuses on PCBs for planning and scoping pump station pilot diversion projects; parallel load reduction calculations for mercury are included for completeness with the MRP requirements.

The MRP states that the objectives of the pilot diversion pilot studies are to:

- Evaluate the reduced loads of PCBs and mercury from diversion of dry weather and first flush urban runoff to sanitary sewers;
- Gain knowledge and experience to determine the implementation level of urban runoff diversion in subsequent permit terms; and
- Document the knowledge and experience gained through pilot implementation.

The pilot diversion projects that would result from this study are not expected to be the sole, or even most significant, actions to implement reductions in discharges for the PCBs TMDL. Although pilot diversions are expected to yield some quantifiable pollutant load reduction benefit, the most significant benefit of the pilot projects is the lessons learned about key management questions:

- Can pilot diversion of first flush and/or dry weather urban runoff significantly reduce stormwater loads of PCBs?
- What is the cost per gram of PCBs removed by the pilot diversion approach?
- How does that cost per gram for pilot diversion compare to alternatives such as pollution prevention, remediation of contaminated sites, strategies to enhance pollutant removal during sediment management, and stormwater treatment retrofits?
- What are the technical, regulatory, and institutional challenges to stormwater diversion into POTWs for the purposes of reducing PCB loads?
- What would motivate a POTW to accept stormwater for treatment?

Answering these management questions is beyond the scope of this FER. The questions above establish a framework for the final report on the pilot projects.

[1] The PCBs TMDL assumes that the non-urban contribution of PCBs is relatively small, i.e., < 0.1 kg/yr, compared to the urban contribution. If this assumption is correct, then the requirement for a 90 percent load reduction from “all stormwater sources” would have essentially the same outcome as requiring a 90 percent load reduction from urban stormwater.

1.2 Planning Context

It is important to understand the overall planning context of this FER. Pilot diversion projects are but one facet of a broader control strategy for PCBs and mercury that involves many different activities (Figure 1-1). The implementation plans for the PCBs and mercury TMDLs are adaptive – lessons learned during the first decade of implementation will guide future emphasis on projects and activities that have relatively greater efficacy per unit cost. Projects required of stormwater dischargers to adaptively implement the mercury and PCBs TMDLs are specified in provisions of the MRP, and are briefly summarized below.

Load reductions expressed as WLAs in a TMDL are implemented by the SFB-RWQCB through provisions in adopted NPDES permits. For Bay Area stormwater dischargers, the MRP requires four general types of pilot projects and activities to show progress towards attaining WLAs for PCBs and mercury: pollution prevention, remediation of contaminated sites, strategies to enhance pollutant removal during sediment management, and stormwater treatment.

Pollution prevention activities focus on stopping PCBs and mercury from getting into stormwater in the first place. Pollution prevention for mercury focuses on collection and recycling of mercury-containing products (Provision C.11.a of the MRP). Pollution prevention for PCBs focuses on industrial inspections (Provision C.12.a), such as the evaluation and prevention of PCB release from building materials such as caulk (Provision C.12.b).

Remediation of contaminated sites and strategies to enhance pollutant removal during sediment management rely on the fact that both mercury and PCBs tend to be associated with sediments. Monitoring studies have shown that PCB concentrations are heterogenous throughout the San Francisco Bay area. Substantial concentrations of PCBs in sediments (e.g, 1 mg/kg up to 90 mg/kg) may be found today in flood control conveyances downstream of areas where PCBs were historically used and/or released (Yee and Mckee, 2010)[2]. The report by Yee and Mckee (2010) also pointed out that in many cases, identification of high PCB concentrations in sediments at one location would indicate that a "halo" of elevated PCB concentrations in sediments may be found within approximately 2500 meters of the contaminated site. Provisions C.11.c and C.12.c require pilot projects to investigate and remediate on-land locations with elevated PCB and mercury concentrations in sediment.

Provisions C.11.d and C.12.d require pilot projects to develop and pilot-test methods to enhance removal of sediment with PCBs and mercury, mainly during existing municipal street and storm drain system operation and maintenance activities. These provisions also require consideration of street flushing and routing to the sanitary sewer, an approach that overlaps with one of the scenarios evaluated in this FER (stormwater conveyance cleanouts). In addition to managing contaminated sediments through street sweeping and cleanouts of stormwater conveyances, it will be important to focus efforts on removing or capping in-place sources of contaminated sediments to streets and stormwater conveyances.

Stream maintenance and ecosystem restoration projects in streams and baylands at times involve sediment removal and/or stream bank stabilization. To the extent that those activities also remove or isolate in place contaminated sediment, they provide a load reduction benefit to the Bay. Conversely, if stream maintenance or ecosystem restoration projects mobilize previously isolated contaminated sediments, those activities would increase contaminant loads to the Bay.

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[2] The summary report by Yee and Mckee compiles data from studies including: Applied Marine Sciences (AMS) Inc. (2002a); AMS 2002b; AMS, 2007; EOA (20002a); EOA (2002b); EOA (2002c); EOA (2003a); EOA (2003b); EOA (2004); EOA (2007a); EOA (2007b); and Klienfelder (2006). Those original reports are available in the supplemental CD provided with this FER.

Stormwater treatment may be beneficial in situations where it is too late to prevent on-land pollution, and defined, controllable source areas cannot be identified. Stormwater treatment can include designing and constructing dedicated treatment retrofits to serve contaminated catchments. Pilot treatment retrofits are required under Provision C.11.e for mercury and C.12.e for PCBs.

MRP Provisions C.11/12.c., d., and e. are being implemented through a regional collaboration that is funded through a grant from the United States Environmental Protection Agency, with local cost matches (BASMAA, 2010). Alternatively, stormwater treatment can be accomplished by existing POTWs, if diversion and conveyance systems can be feasibly constructed and a local POTW can be identified that is willing and able to provide treatment services. That approach is required by Provision C.11.f for mercury and C.12.f for PCBs, and this approach is the focus of this FER.

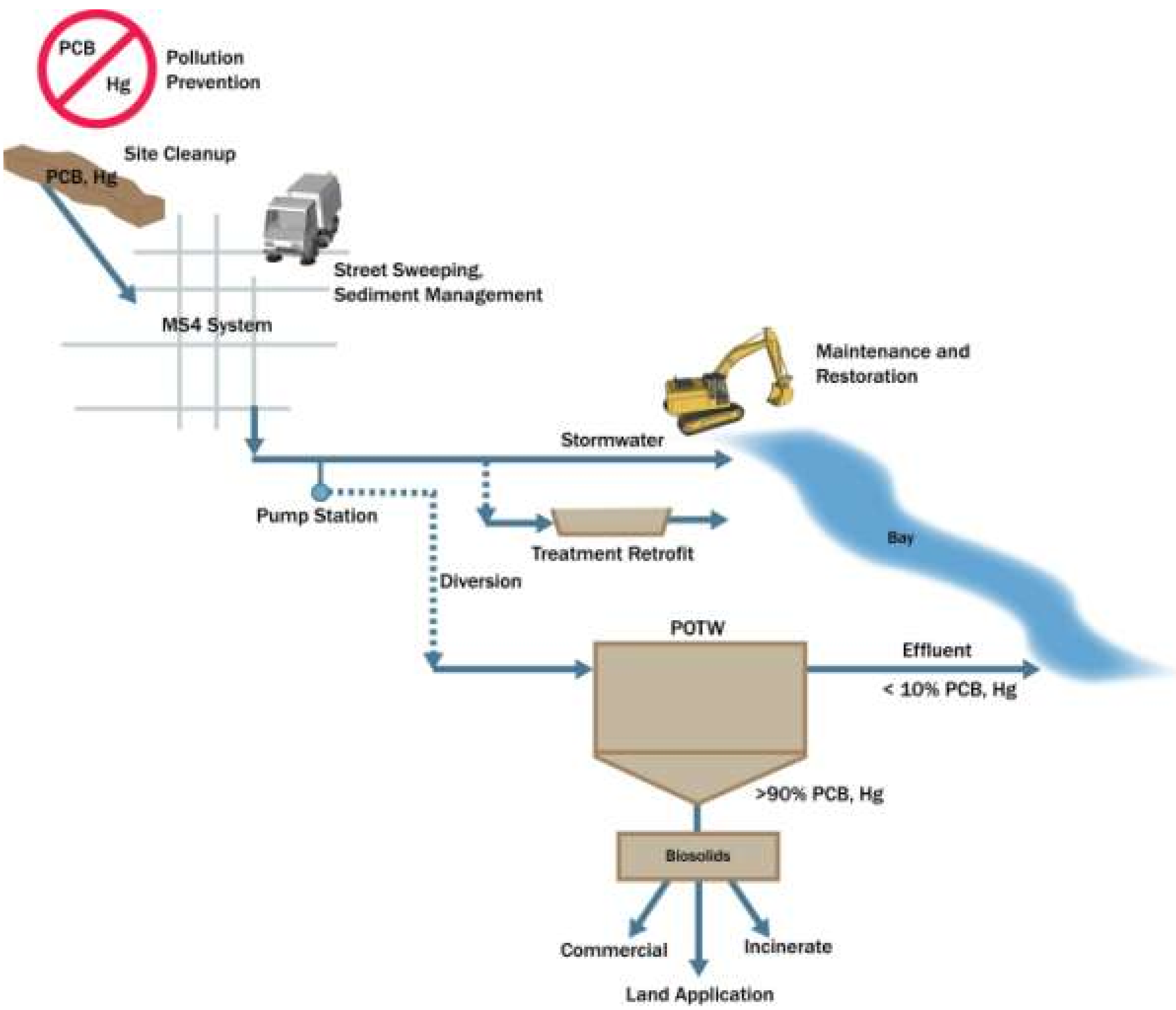

Figure 1-1. Conceptual Illustration of Pilot Stormwater Diversion to POTW Projects in Context with Other Potential Control Strategies

Section 2

Approach

2.1 BASMAA Technical Oversight

This report has been prepared under the direction of BASMAA representatives. The scope of work was developed through a series of discussions at BASMAA Monitoring and Pollutants of Concern (MPC) committee meetings in January through March, 2010. Staff and Permittees from each countywide stormwater program began meeting once a month in June 2010 to provide technical oversight to development of this FER. This Technical Oversight Committee (TOC) will continue to advise Permittees who are scoping and implementing pilot diversion projects. The primary role of TOC during the implementation stage will be to provide consistency in effectiveness evaluation methods and peer review on the value of new information expected from pilot projects and the merits of diversion pilots as compared to other pollutant control alternatives possible at the proposed locations. The TOC for this FER also has considerable overlap with the Clean Watershed for a Clean Bay (CW4CB) grant project, providing coordination between the two experts.

2.2 Information gathered

In general, two types of information were gathered and compiled for this report: information on contaminated sediments in the Bay Area, and information about urban runoff diversion into POTWs. In addition, geographic information systems (GIS) data were made available by the San Francisco Estuary Institute (SFEI) upon completion of their Proposition-13 funded study focused on urban runoff best management practices (Yee and Mckee, 2010). Concentrations of PCBs in sediments have been superimposed on locations of pump stations and POTWs to assist in the selection of candidate locations. Maps of POTW service areas are provided alongside the GIS representations to further assist the selection[3].

2.3 Approach to Development of Selection Criteria

The approach to developing the draft selection criteria starts by looking at other programs that have scoped and/or implemented urban runoff diversion projects. The approach builds on the thought process worked out by other programs by addressing the following questions:

- What selection criteria have been used by other programs to evaluate the feasibility of urban runoff diversions into treatment plants?
- What are the most appropriate selection criteria for projects in the San Francisco Bay region that would meet the requirements of Provision C.11.f/C.12.f? Selection criteria should address relevant pump station and POTW characteristics and institutional barriers/incentives.
- What regional and site information is needed to evaluate a project using the selection criteria?
- What specific regional information is currently available that would enable use of the selection criteria?

[3] Note to BASMAA reviewers: GIS layers of POTW service areas have been recently acquired and, at the direction of the oversight committee for this report, can be incorporated directly onto the maps of contaminated sediments and pump station locations.

- What are the known data gaps?
- How would a program that is scoping a diversion project address the data gaps?

2.3.1.1 Selection criteria used by other programs

This section summarizes selection criteria used to scope and/or implement pilot diversion projects from three case studies: California Beach communities, the Las Vegas Valley, and the California Department of Transportation.

2.3.1.1.1 California Beach Communities

During the information gathering stage of this project, the following California communities were identified that have developed diversion programs:

- Orange County
- San Diego County
- Los Angeles County
- Ventura County
- Monterey County
- Santa Cruz County

All of the counties above have beach communities. Essentially all of the dry weather diversion projects carried out in those communities have been motivated by the need to reduce or eliminate sources of bacteria to beaches and other areas used for water contact recreation. Of the programs reviewed, the Orange County Watersheds (2003) report was the only one which provided detailed documentation of their selection (or decision) criteria. The flowchart illustrating the decision criteria for dry weather diversions in Orange County is shown in Figure 1.

The Orange County selection criteria thought process illustrated in Figure 1 starts by screening against the two following general questions about dry weather discharges in coastal watersheds:

- Is there a water quality impairment to be addressed?
- Are there source control or treatment alternatives to dry weather diversions?

If the answers are yes, there is a water quality impairment and no, there are no better alternatives such as source control or onsite treatment, then the site is assessed against acceptability criteria for diversion into the Orange County Sanitation District conveyance and treatment system. Acceptability criteria used in Orange County Watersheds (2003) are:

- Local conveyance and treatment capacity;
- Potential to impact recreation or habitat by diversion;
- Other community and/or regulatory concerns.

As noted above, the Orange County Watersheds (2003) report is the most formal documentation of diversion selection criteria available. Interviews with project stakeholders from some of the above beach communities (e.g., City of Santa Cruz, Orange County Sanitation District), were conducted during the development of a draft Selenium Management Plan for Las Vegas Wash (Brown and Caldwell, 2009a). In addition, stakeholders involved in dry weather diversions in the cities of Los Angeles and Ventura were interviewed during the development of a white paper on urban runoff diversions on behalf of the Bay Area Clean Water Agencies (Carollo, 2009). Those stakeholder interviews tend to support the more formal acceptability criteria, as outlined above.

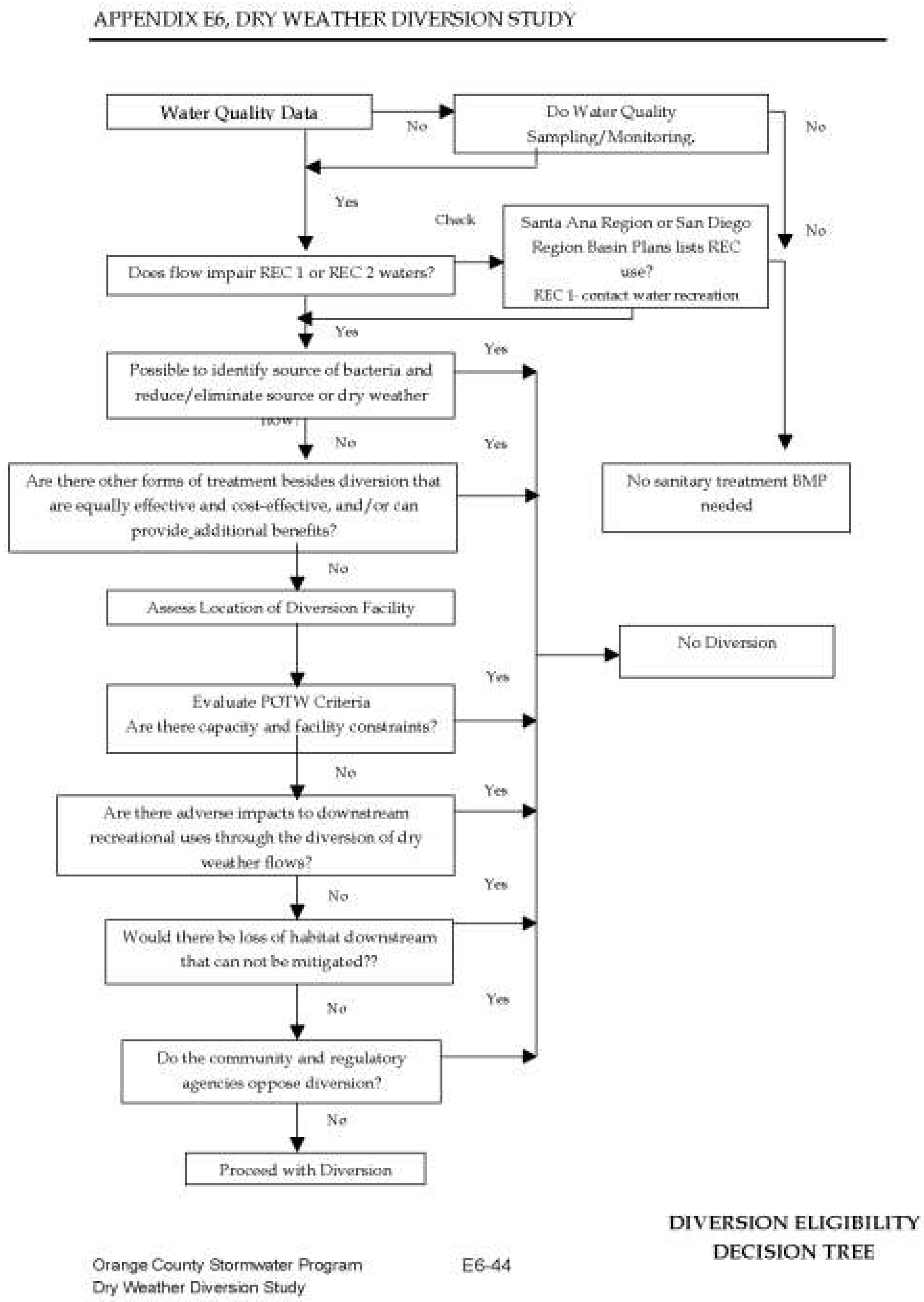

Figure 2-1. Decision Tree for Dry Weather Diversion Consideration in Orange County, California.

From Orange County Stormwater Program (2003)

2.3.1.1.2 Las Vegas Valley

The draft Las Vegas Wash Selenium Management Plan (Brown and Caldwell, 2009a) followed an overall thought process similar to Southern California beach diversion projects, starting with water-quality needs and source area opportunities, and subsequently screening opportunity areas against capacity, constructability, cost, and community acceptance criteria. In the case of the Las Vegas Wash, the pollutant of concern was selenium in a desert wetland ecosystem, rather than bacteria in waters of swimmable beaches. The interest in reducing selenium loads was as a mitigation measure for the construction of an effluent bypass pipeline project to a deepwater outfall at Lake Mead. If constructed, the pipeline would generate electric power from the elevation drop to Lake Mead, and it would remove treated wastewater discharges from the Las Vegas Wash. These discharges provide dilution of selenium concentrations within existing groundwater seepage that enters the wash. Consequently, a means of reducing selenium loads via diversion of dewatering and seepage flows from tributaries of the wash into wastewater treatment plants would add value to the project by enabling diversion of relatively larger effluent flows from Las Vegas Wash into the pipeline, thereby creating relatively more electric power while concurrently reducing surface water impacts of treated effluent to Lake Mead, as the pipeline would allow discharge at the bottom of the lake.

The selection criteria led to diversion of selenium seepage sources into treatment plants from the base of watersheds as the most cost-effective alternative, because of the economic value of water flowing through the proposed bypass pipeline. The plan accounted for uncertainty in the alternatives analysis by proposing an adaptive approach that would initiate the more straightforward diversion projects in initial stages, while concurrently evaluating the feasibility of reducing seepage flows by changes in upland irrigation management practices or installation of onsite treatment or upstream diversion projects. The adaptive management decision tree proposed in the draft Las Vegas Wash Selenium Management Plan is illustrated in Figure 2-2 below.

Owing to declining economic conditions in the Las Vegas Valley, the bypass pipeline project has been put on hold (i.e., shelved); therefore, the draft Selenium Management Plan has not advanced beyond the planning and conceptual design/cost estimating stage. The draft plan does offer useful preliminary design and cost estimating concepts for large scale (i.e., 1 to 6 mgd) diversion projects involving varying levels of complexity in conveyance system design.

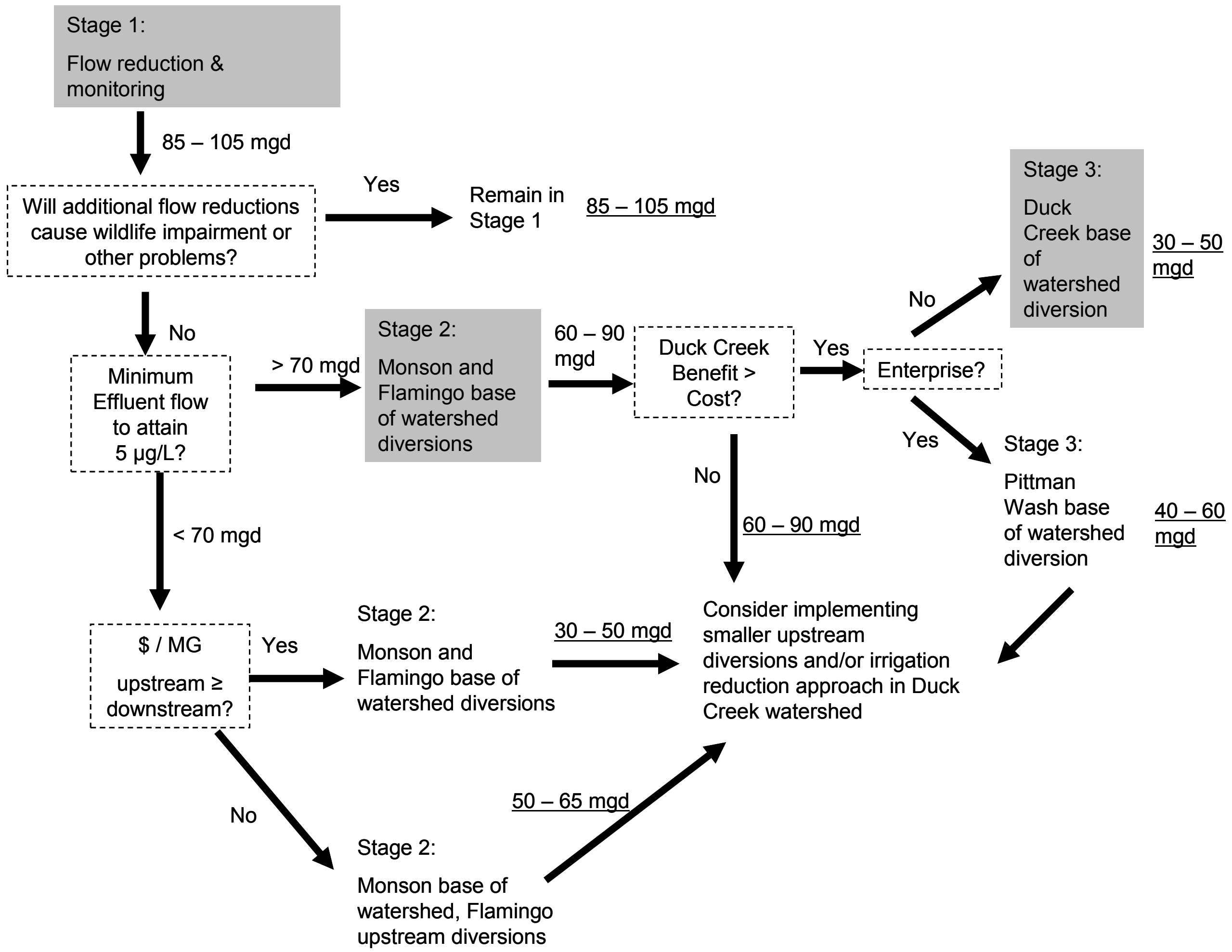

Figure 2-2. Adaptive Management Decision Tree for the Las Vegas Wash Selenium Management Plan.
Numbers associated with each arrow represent the estimated minimum effluent flow range (mgd) to attain 5 µg/L water quality standard at the completion of each stage. The goal of the plan is to attain the lowest possible effluent flow, while maintaining selenium concentrations below the water quality standard. Underlined numbers represent the estimated minimum effluent flow ranges at the completion of Plan implementation. Dashed boxes indicate decision points. Shaded boxes indicate the likely course of action based on current information.

2.3.1.1.3 The California Department of Transportation (Caltrans)

The Caltrans Stormwater Quality Handbooks' Project Planning and Design Guide (PPDG) defines a regimented process for selection of structural BMPs during the design process for major projects. Selection criteria are defined by the "T-1 Checklist," which appears in Appendix E of the PPDG. If dry weather flows are present, designers are to consider dry weather diversions. Figure 2-3 below shows the feasibility and design criteria used in the Caltrans design process to consider dry weather diversions. The Caltrans example is a useful starting point for informing more detailed selection analysis of siting and design feasibility.

One example of a dry weather diversion constructed by Caltrans is the Jamboree Road overcrossing near Interstate 5 in Orange County. In that location, dewatering discharges are sent to the Orange County Sanitation Disrtict because of concerns over nitrogen and selenium in San Diego Creek. An example of temporary diversions by Caltrans is the Caldecott Tunnel, connecting Alameda County and Contra Costa County. Power washing discharges from the tunnel are diverted to the East Bay Municipal Utility District.

Dry Weather Flow Diversion

Feasibility

1. Is a Dry-Weather Flow Diversion acceptable to a Publicly Owned Treatment Works (POTW)? ☐Yes ☐No
2. Would a connection require ordinary (i.e., not extraordinary) plumbing, features or construction methods to implement? ☐Yes ☐No

   If "No" to either question above, Dry Weather Flow Diversion is not feasible.

3. Does adequate area exist within the right-of-way to place Dry Weather Flow Diversion devices? ☐Yes ☐No
   If "Yes", continue to Design Elements sections. If "No", continue to Question 4.
4. If adequate area does not exist within right-of-way, can suitable, additional right-of-way be acquired to site Dry Weather Flow Diversion devices and how much right-of-way would be needed? __________ (acres) ☐Yes ☐No
   If "Yes", continue to the Design Elements section.

   If "No", continue to Question 5.
5. If adequate area cannot be obtained, document in Section 5 of the SWDR that the inability to obtain adequate area prevents the incorporation of this Treatment BMP into the project. ☐Complete

Design Elements

* **Required** Design Element – A "Yes" response to these questions is required to further the consideration of this BMP into the project design. Document a "No" response in Section 5 of the SWDR to describe why this Treatment BMP cannot be included into the project design.

** **Recommended** Design Element – A "Yes" response is preferred for these questions, but not required for incorporation into a project design.

1. Does the existing sanitary sewer pipeline have adequate capacity to accept project dry weather flows, or can an upgrade be implemented to handle the anticipated dry weather flows within the project's budget and objectives? * ☐Yes ☐No
2. Can the connection be designed to allow for Maintenance vehicle access? * ☐Yes ☐No
3. Can gate, weir, or valve be designed to stop diversion during storm events? * ☐Yes ☐No
4. Can the inlet be designed to reduce chances of clogging the diversion pipe or channel? * ☐Yes ☐No
5. Can a back flow prevention device be designed to prevent sanitary sewage from entering storm drain? * ☐Yes ☐No

Figure 2-3. Feasibility and Design Criteria Used by Caltrans for Dry Weather Diversions.

From the December 2008 Update of the Caltrans PPDG, Appendix E, T-1 Checklist Part 3

Feasibility Question #2 in Figure 2-3 above references "extraordinary plumbing." By way of example, the Caltrans PPDG defines extraordinary plumbing:

> "Sites requiring extraordinary plumbing to collect and treat runoff (e.g., jacking operations under a highway, bridge deck collection systems, etc.) may be considered infeasible due to their associated costs. Sites requiring extraordinary features or construction practices, such as retaining walls and shoring, may also be infeasible due to their associated costs relative to the cost of the BMP itself."

Other than those examples of extraordinary plumbing, the wording of the PPDG is deliberately broad to allow the designer and the District Stormwater Coordinator lattitude to make design decisions.

In summary, the most well-documented programs of urban runoff diversion into sanitary conveyance and treatment systems involve dry weather diversions of urban runoff. In both the California beaches and Las Vegas Wash examples discussed above, the evaluation criteria started with water quality needs, then looked for alternatives to diversion to POTWs, and then screened diversions against acceptability criteria including conveyance and treatment capacity, constructability, cost, and community/regulatory acceptance. In the Caltrans example, the selection criteria reviewed focused on feasibility and constructability. Some important distinctions that set the above examples apart from this FER are:

- The tangible benefits of reducing beach closures or harvesting water in a desert may be more immediate and apparent to municipal decision makers than the concept of reducing PCB loads to the Bay; and
- The technical challenges of capturing and treating first flush and other stormwater flows would require some refinements to selection criteria to be used in this FER.

With those distinctions in mind, Section 3.1 in the Findings section below builds on the framework of "needs, alternatives, acceptability" to propose screening criteria to be used in this FER.

2.4 Approach to Develop Cost/Benefit Analysis

2.4.1 Cost Estimating Tools

Cost estimates for pilot diversions can be divided into two categories: **capital costs**, and **operations and maintenance (O&M) costs**.

Capital cost estimates for each component of a pilot diversion project are shown in Table 2-1. The estimates were developed from existing case studies for different agencies. These estimates are provided to illustrate ranges and will vary substantially depending on the agency and pump station location. Construction materials and labor will vary depending on the type of pilot diversion to be constructed. A pilot diversion which requires no additional pumps and is adjacent to a sanitary sewer line with excess capacity will have relatively small construction costs, while a pilot diversion which requires large quantities of large diameter pipe will cost much more. Connection fees will also vary depending on the sanitation agency and location of the pilot diversion. Diversions to POTWs with excess plant and sanitary sewer capacity will cost less than locations which require upgrades to sanitary sewers and treatment plants. Right-of-way (ROW) acquisition would depend on the type and quantity of land which is acquired. For the purposes of this analysis, it is assumed that ROW acquisition (or overly complex easement agreements) or treatment plant upgrades would lead to the conclusion that a pilot diversion project is not feasible. Supervisory control and data acquisition (SCADA) control costs will vary depending on the type of monitoring and control equipment specified. Some form of monitoring and controls would likely be required in all cases.

Table 2-1. Planning Cost Estimates for Pilot Diversion Project Components		
Component	**Cost Range ($1000's)**	**Factors Affecting Cost**
Construction Materials and Labor	25 – 750	Type of pilot diversion, length
Connection Fees	9 – 18/1,000 gpd	Sanitary sewer capacity, plant capacity, sanitary sewer ordinance requirements, discharge/sanitary sewer use fees
Right of Way	Variable	Size, land use, location
SCADA/Safety Controls	10 – 50	Type of monitoring/control
Capital Support (Permits, Planning and Design)	40 percent of construction costs	Complexity of diversion

Cost estimates based on information from Brown and Caldwell (2009a); Brown and Caldwell (2009b); Sacramento Stormwater Quality Partnership (2006); Orange County Stormwater Program (2003); San Francisco Estuary Partnership (2010).

Another significant consideration affecting capital costs would be the need to re-route existing utilities to accommodate the diversion. This has been a major cost factor in determining acceptable locations for treatment measures targeted at other pollutants, e.g. large in-line trash capture devices. For the purposes of this FER, those additional costs are not considered for pilot projects, as significant re-routing is assumed to be outside the scope of a pilot project.

O&M Costs are primarily related to the annual cost of electricity to operate pumps (if needed), monitoring the diversion to ensure proper function, scheduled and emergency maintenance of pumps and diversion structure, and the treatment fees established by the receiving POTW. Cost estimates for these activities and items are summarized in Table 2-2 below. The annual costs of electricity, inspections and maintenance are derived from monthly O&M costs reported by the Orange County Stormwater Program (2003) for small diversions ranging from 0.01 MGD to 0.3 MGD. By comparison, the Sacramento Stormwater Quality Partnership (2006) estimated annual O&M costs of $40,000 for similarly sized diversions. The lower range of treatment fees is based on the estimated "chemicals and electricity only" costs for a large Las Vegas Valley treatment plant estimated by Brown and Caldwell (2009a). The upper range is based on the "whole plant operational costs" estimated by Brown and Caldwell (2009a). The actual fee charged will depend on the individual POTW, and the jurisdictional relationship between the POTW and the stormwater discharger and local sanitary sewer use ordinance requirements. For comparison, treatment fees estimated by the Sacramento Stormwater Quality Partnership (2006) are approximately $340 per MG treated; The San Jose /Santa Clara Water Pollution Control Plant reports O&M costs of approximately $400 per MG treated.

Table 2-2. Planning O&M and Treatment Cost Estimates for Pilot Diversion Projects	
Pump electricity, inspections and maintenance ($/year)	10,000 – 60,000
Treatment fees ($/MG gallons treated)	300 – 2400

Cost estimates based on information from Brown and Caldwell (2009a); Brown and Caldwell (2009b); Sacramento Stormwater Quality Partnership (2006); Orange County Stormwater Program (2003).

Electricity costs would be reduced for intermittent pumping, in proportion to the planned run time. For planning purposes, it can be assumed that a minimum of $5,000 per year is required for inspections and maintenance.

Table 2-3 shows the estimated costs for different potential pilot diversion scenarios. It is important to note that these cost estimates are based on simplifying assumptions and existing information. Actual costs can vary heavily depending on site/diversion specific characteristics.

For non-constructed pilot diversions there are no capital costs as the pilot diversion occurs by rented equipment and hired labor. The operation costs will vary depending on how the pilot diversions are staged. For pilot diversion and cleanouts staged during dry weather, scheduling and availability of equipment and staff is easier, thus lower costs are achieved, as opposed to increased costs attributed to mobilizations in response to wet weather events. The expected capital costs of constructed pilot diversions will vary depending on conveyance distance, pipe size, and if additional hydraulic head is required to divert stormwater.

Two types of constructed pilot diversions are potentially available. The type employed would depend on the location of the pump station (Figure 2-4). The one type (Option 1) would involve the installation of an additional pump (or pumps) within the wet well to divert flow directly to the sanitary sewer. This type of diversion provides inherent control of the quantity of water that can be diverted to the sanitary sewer, but involves higher initial costs due to pump station reconfiguration. However, the use of dedicated pumps selected to match the specific head requirements of the conveyance system would allow that system to be optimized, i.e., smaller pipe sizes can be used. This could result in cost saving for the conveyance system, which could be of particular importance for systems that require long conveyance pipes. Operation and maintenance would vary depending on the type and size of the pilot diversion. Another option (Option 2) would be a gravity-fed flow system using the existing pumps and capacity of the station. All stormwater discharged after the pumps would be diverted using only gravity flow to the sanitary sewer. A weir or other control device would be needed to prevent overloading of the sanitary sewer during large storm events. This type of pilot diversion requires larger-sized pipes, but no additional pumps. Gravity flows and passive pilot diversions would require less O&M while larger flows and pumps would regularly fall on the higher end of the expected range.

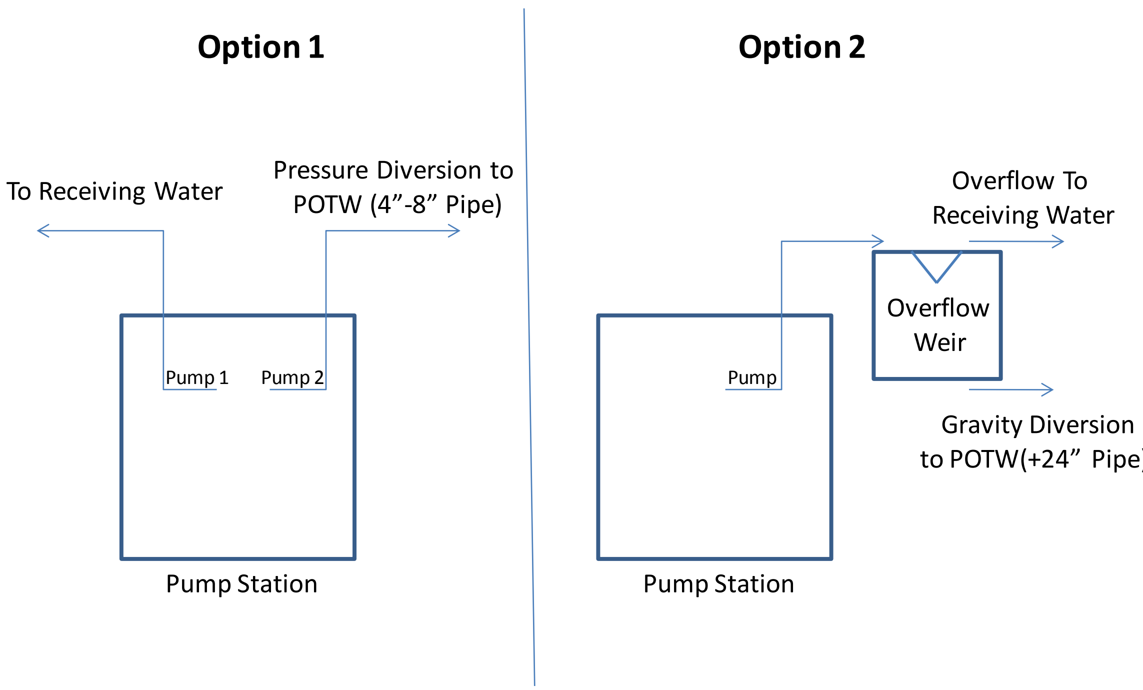

Figure 2-4. Conceptual diagram of two different options for pump station diversions.

Table 2-3. Estimated Costs for Different Pilot Diversion Approaches

Pilot Diversion Approach	Capital Cost ($1,000)	O&M Cost ($1,000/yr)
Non-constructed pilot diversion using all rented equipment for strategic cleanout (7 days duration)	0	28
Non-constructed pilot diversion using all rented equipment in dry weather (90 days duration)	0	360
Non-constructed pilot diversion using all rented equipment in wet weather (30 days duration)	0	180
Constructed pilot diversion adjacent to sanitary sewer large enough to support gravity feed	100	10 – 60
Constructed pilot diversion adjacent to sanitary sewer requiring pumped feed	500	10 – 60
Constructed pilot diversion with moderate connection distance (<500 ft) to sanitary sewer large enough to support gravity feed	500 – 1,500	10 – 60
Constructed pilot diversion with moderate connection distance (<500 ft) to sanitary sewer via small diameter conveyance requiring pump	500 – 1,000	10 – 60
Constructed pilot diversion with long connection distance (>500 ft) to sanitary sewer large enough to support gravity feed	1,500 – 3,000+	10 – 60
Constructed pilot diversion with long connection distance (>500 ft) to sanitary sewer via small diameter conveyance requiring pump	500 – 1,500	10 – 60

Temporary pilot diversion costs assume $4,000 per day for labor during dry weather pilot diversions (four person crew) and equipment (one 20,000 gallon storage tank, three pumps, two support trucks, temporary check dams, and incidental equipment). Temporary pilot diversion costs are assumed to be 50 percent higher ($6,000 per day) during wet weather because of difficulties introduced by scheduling, safety and logistics.

2.4.2 Load Estimating Tools

The potential PCB load reduction benefits attainable from pilot diversion projects can be estimated based on either expected average PCB concentrations in stormwater, or expected average PCB concentrations in sediments captured by the pilot diversion. This section provides planning tools to assist with this estimation.

The first approach starts by asking "how much water is expected to be diverted into the POTW," and "what is the average PCB concentration in that diverted water?" Water volumes can be estimated from the design storm perspective and the conveyance and treatment capacity perspective. The design storm perspective would multiply the catchment area (acres) by the design storm event (inches of rain) to derive the treatment volume, after unit conversion. However, in most cases, the limiting factor on treatment volume would be storage, conveyance and treatment capacity. Therefore, it makes most sense, for scoping purposes, to base treatment volume estimates on constraints established by the conveyance system, available storage capacity (if any), and limits on the treated volume that are either set by the POTW or that necessarily result from treatment costs. A similar approach would apply to dry weather diversions; rather than design storm considerations the flow question for a dry weather diversion would be "what is the average expected dry weather flow."

For reference, a typical portable water tank can hold approximately 20,000 gallons. A diversion pump running at 75 gpm would move approximately 100,000 gallons in a day. If a 50 MGD treatment plant accepted up to 500,000 gallons of stormwater per day, the pilot diversion would use about 1 percent of the treatment capacity of the plant. Flows spanning this range are used to estimate loads.

PCB concentrations in stormwater can be estimated based on limited case study information available. The Ettie Street Pump Station Supplemental Environmental Project report (EBMUD 2010) serves as a useful benchmark for PCB concentrations in stormwater from a highly contaminated catchment of about 8 square kilometers comprised of mixed urban land uses with a predominantly industrial history. The report also provides data from Cerrito Creek, which is a similar sized catchment having an open creek in a suburban location that recieves stormwater flows from upstream residential and commercial areas.

- Average PCB concentrations in dry weather from the Ettie Street Pump Station ranged from 3 ng/L to 5 ng/L at the pump station, and approximately 1 ng/L at the reference creek (Cerrito Creek).
- Average first flush stormwater concentrations ranged from 16 ng/L in Cerrito Creek to as much as 50 ng/L in the first flush and wet weather influent to the Ettie Street Pump Station.
- Episodic measurements as high as 200 ng/L were observed.
- That concentration range is used as a basis for estimating PCB loads removed by pilot diversions ranging from 20,000 gallons to 500,000 gallons in Table 2- below.

Table 2-4 highlights the fact that dry weather diversions would not yield substantial load reduction benefits if the PCB concentrations are relatively low (e.g., 1 ng/L). A dry weather diversion of 0.1 mgd would yield between 0.0004 to 0.004 grams of PCBs per day, or 0.1 to 1 grams per year if dry weather flows were pumped 250 days out of the year. That is equivalent to 0.0006 to 0.006 percent of the total PCB load reduction (18 kg) required from urban stormwater by the TMDL. To attain 10 percent of the total PCB load reduction (i.e., 1.8 kg), a total of 3.5 billion gallons per year of dry or wet weather runoff having an average concentration of 50 ng/L would be required.

For storm events that yield higher PCB concentrations in runoff, more substantial load reductions may be attained. If 100,000 gallons of water having 200 ng/L PCBs were diverted from a single storm event, a total mass of 0.08 grams of PCBs could be diverted from discharge to the Bay. If 500,000 gallons could be diverted during a single event, it would be equivalent to 0.4 grams of PCBs, or 0.002 percent of the 18 kg load reduction required of urban stormwater by the TMDL.

The equation used to calculate values in Table 2-4 is:

$$PCB(g) = PCB\left(\frac{ng}{L}\right) \times Volume\,(gal) \times \frac{3.785\ L}{gal} \times \frac{1g}{10^{9}ng}$$

Table 2-4. PCB Load Estimating Tool (grams)

Diverted Volume (gal)	PCB Concentration in Stormwater (ng/L)				
	1	10	50	100	200
20,000	0.0001	0.0008	0.0038	0.0076	0.015
50,000	0.0002	0.0019	0.0095	0.019	0.038
100,000	0.0004	0.0038	0.019	0.038	0.076
200,000	0.0008	0.0076	0.038	0.076	0.15
400,000	0.0015	0.015	0.076	0.15	0.31
500,000	0.0019	0.019	0.095	0.19	0.38
1,000,000	0.0038	0.038	0.19	0.38	0.76

For context, the expected range of PCB concentrations in stormwater can be estimated based on assumed concentrations of PCBs in sediments and total suspended sediments (TSS) concentrations (Figure 2-5). Typical PCB concentrations in sediments within the urban landscape range from 0.1 mg/kg to 1 mg/kg; contaminated sediments found in localized areas can be as high as 10 mg/kg or more. It is assumed that highly contaminated sediments would be addressed through sediment management or site remediation, and that diversion projects would address more diffuse contamination areas where the average first flush concentration of PCBs on suspended sediments is 1 mg/kg or less. Under typical TSS concentrations in stormwater (< 500 mg/L), PCB concentrations would tend to be 200 ng/L or less.

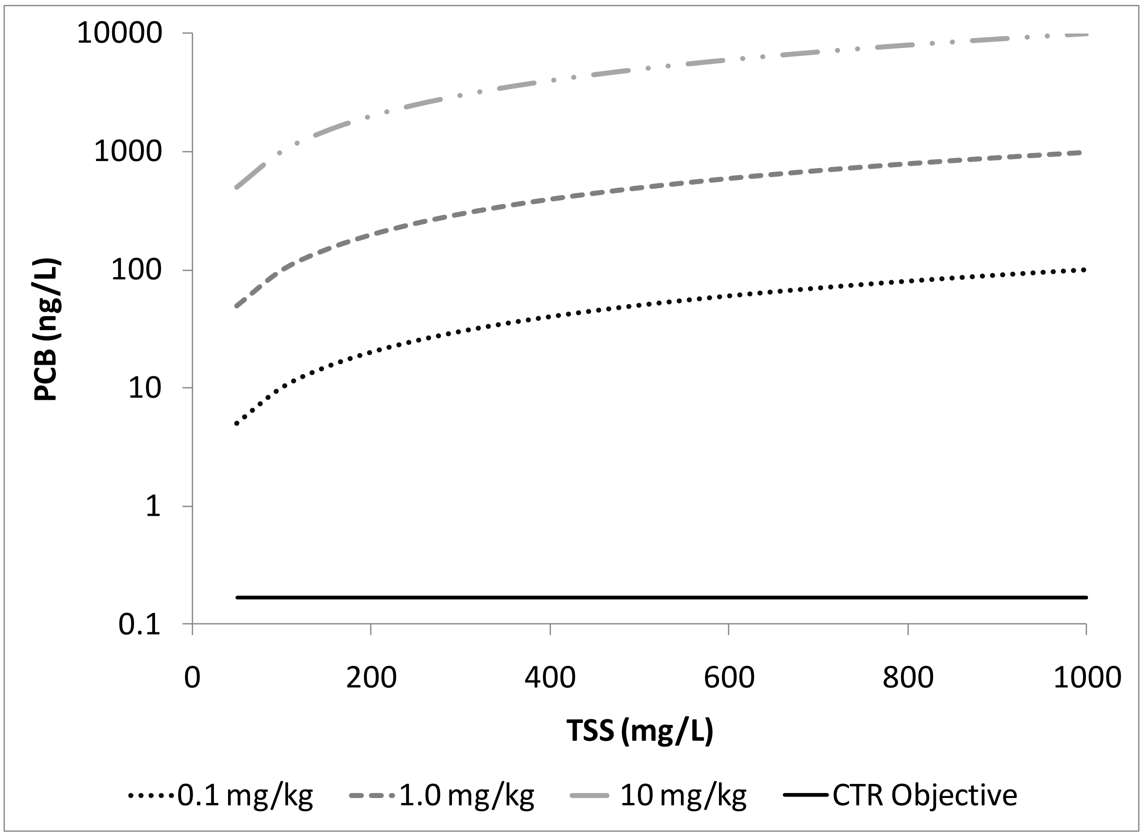

Figure 2-5. Concentrations of PCB vs. TSS under different assumed concentrations of PCBs in sediment.

Solid line indicates the California Toxics Rule (CTR) water quality objective (0.17 ng/L)

Tools similar to those used for PCBs can also be applied to estimating mercury loads avoided (Table 2-5, Figure 2-6). The higher range of mercury concentrations in stormwater (< 2,000 ng/L) reflects the assumption that mercury concentrations in suspended sediments from contaminated areas could be as high as 10 mg/kg.

This approach to load estimating is used to develop the cost-benefit analysis of example pilot diversion scenarios in Section 3.2.

Table 2-5. Hg Load Estimating Tool (grams)					
Diverted Volume (gal)	Hg Concentration in Stormwater (ng/L)				
	1	10	50	500	2000
20,000	0.0001	0.0008	0.0038	0.0379	0.1514
50,000	0.0002	0.0019	0.0095	0.0946	0.3785
100,000	0.0004	0.0038	0.0189	0.1893	0.7570
200,000	0.0008	0.0076	0.0379	0.3785	1.5140
400,000	0.0015	0.0151	0.0757	0.7570	3.0280
500,000	0.0019	0.0189	0.0946	0.9463	3.7850
1,000,000	0.0038	0.0379	0.1893	1.8925	7.5700

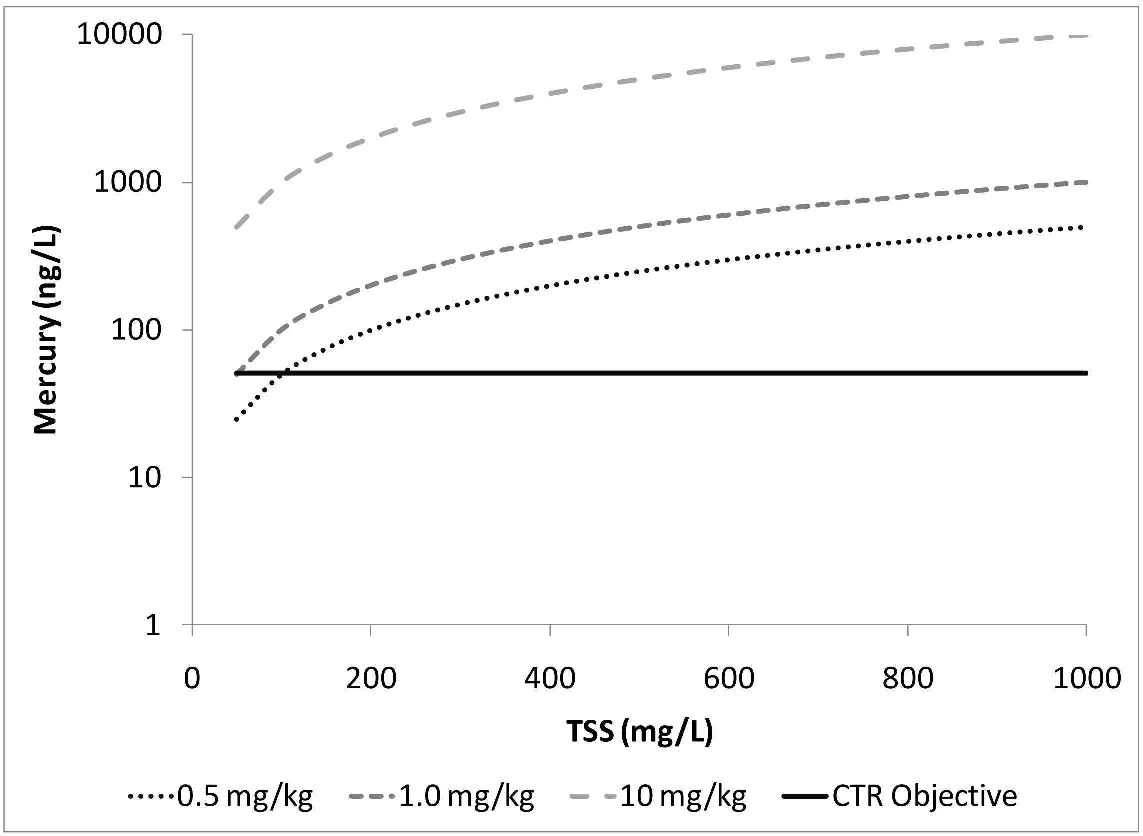

Figure 2-6. Concentrations of Hg vs. TSS under different assumed concentrations of Hg in sediment.

Solid line indicates the California Toxics Rule (CTR) water quality objective (0.50 ng/L)

Section 3

Findings

3.1 Recommended Selection Criteria

This section proposes screening criteria that are developed around the framework of needs, alternatives, and acceptability outlined in the previous sections. These criteria are intended to inform the selection of pilot diversion sites, but may not include all considerations that would need to be taken into account as potential pilot diversion sites are evaluated.

3.1.1 Needs

The overall water quality need is a reduction in the load of PCBs and mercury discharged from urban areas into the Bay. Guidance from the SFB-RWQCB further specifies that pilot diversion projects should focus on abating discharges of PCBs from contaminated drainages, and concurrently evaluate the added value of mercury load reductions achieved by PCB-focused projects. That is, project siting decisions should be led primarily by PCB loads.

Watershed load reduction goals help put PCB loads into context as a selection criterion. The CW4CB grant recently awarded to BASMAA sets forth the ambitious goal of reducing PCB loads by 0.3 to 1.5 kg per year through a series of coordinated investigation, reporting, potential remediation, and treatment retrofit projects. If the goal is achieved, the load reduction would be about one to seven percent of the currently estimated 20 kg per year of PCBs discharging from Bay Area urban storm systems.

It is proposed that individual pilot diversion projects that reduce the current PCB load to the Bay by one percent or more per year (i.e., reduce PCBs by 0.2 kg/yr or more) could be considered meaningful steps towards attainment of the PCB wasteload allocation for urban stormwater. In contrast, pilot projects that attained load reductions on the order of 0.01 kg/year (ten grams) or less would not yield significant progress, by themselves. Small pilots could be useful if they can be cost-effectively replicated numerous times throughout the watershed, or if they provide information that can be scaled up to evaluate the costs and benefits of larger projects.[4]

The selection criteria based on water quality needs are summarized by the following two questions:

Will the project yield a substantial PCB load reduction? An important tool for answering this question is an understanding of the spatial distribution of PCBs in sediments of the San Francisco Bay watersheds. The most recently available synthesis of PCB monitoring data is available in the grant-funded study by Yee et al (2010), titled “Concentrations of PCBs and Hg in soils, sediments and water in the urbanized Bay Area: Implications for best management.” Figures and tables in that report highlight urbanized areas of the Bay with the highest PCB concentrations in sediments collected from catch basins and street curbs.

Provisions C.11.f and C.12.f strongly emphasize existing stormwater pump stations as the most likely areas for pilot diversion projects. Pump station inventory reports have been submitted to the SFB-RWQCB and compiled in tabular and GIS formats. Matching areas of high PCB concentrations in sediments with the known spatial distribution of pump stations is a useful step to efficiently make an

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[4] The SFB-RWQCB has stated that diversion projects may have other benefits unrelated to PCBs and Hg (e.g., reductions in discharges of low DO water, bacteria, etc.

initial screening of likely candidate pump stations based on potential for load reductions. Figures 3-1 through 3-6 below show the locations of pump stations, measured PCB concentrations in storm drain sediments, and POTW service areas. For illustration purposes, only sediment samples with detectable PCB concentrations are included in the figures. These planning tools can be used to assist in the evaluatation of the water quality needs criteria.

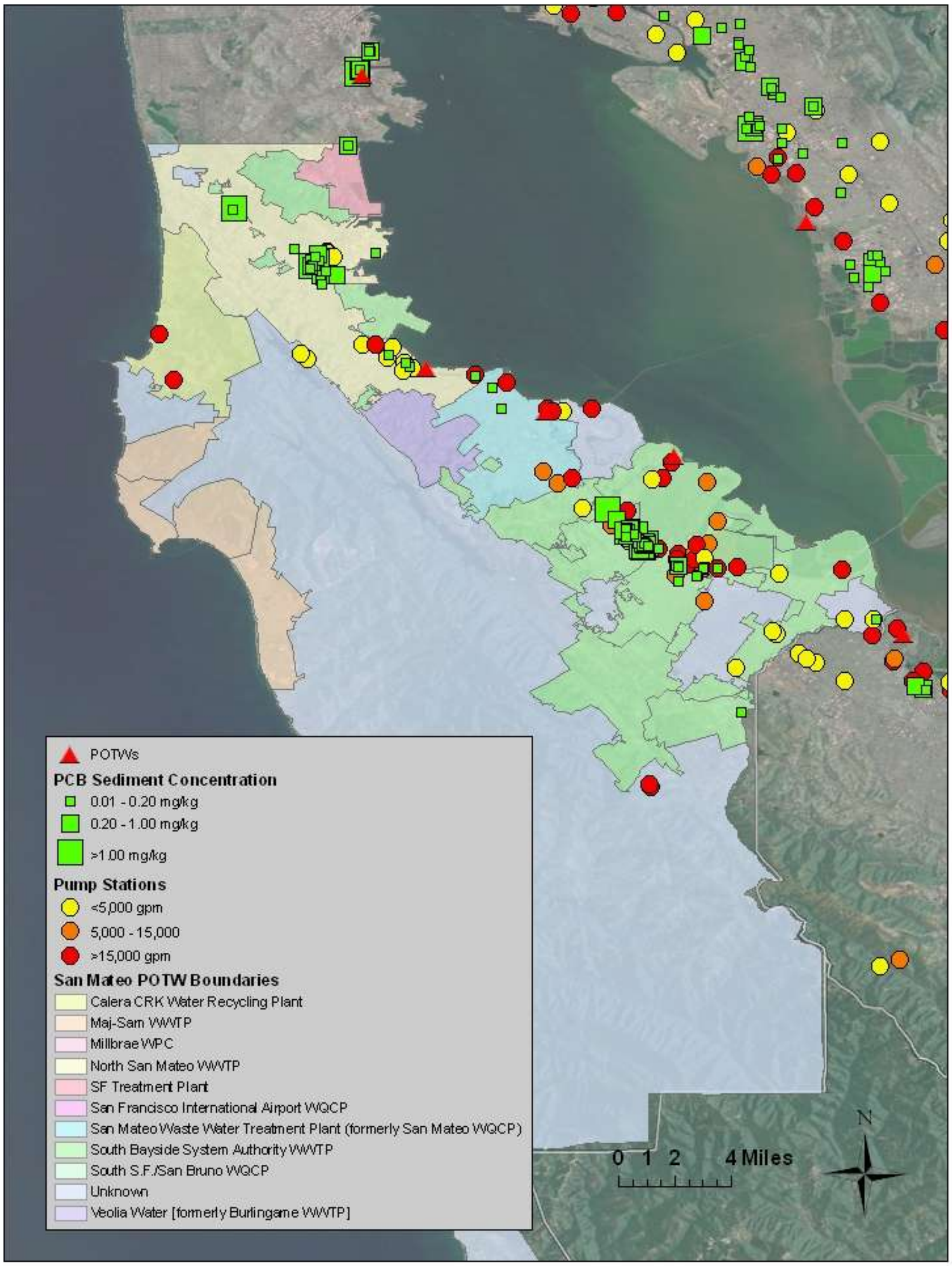

Figure 3-1. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in San Mateo County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

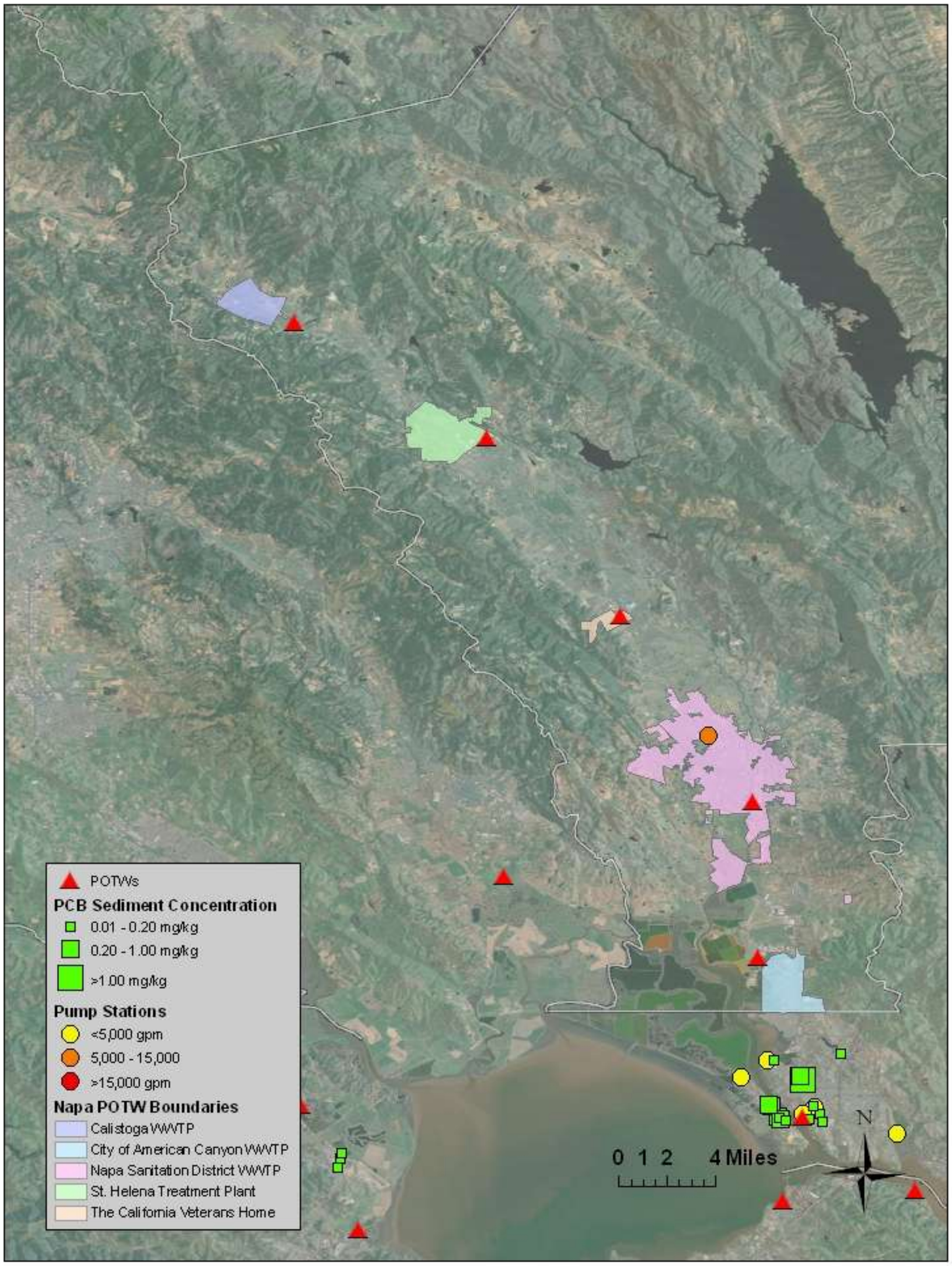

Figure 3-2. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Napa County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

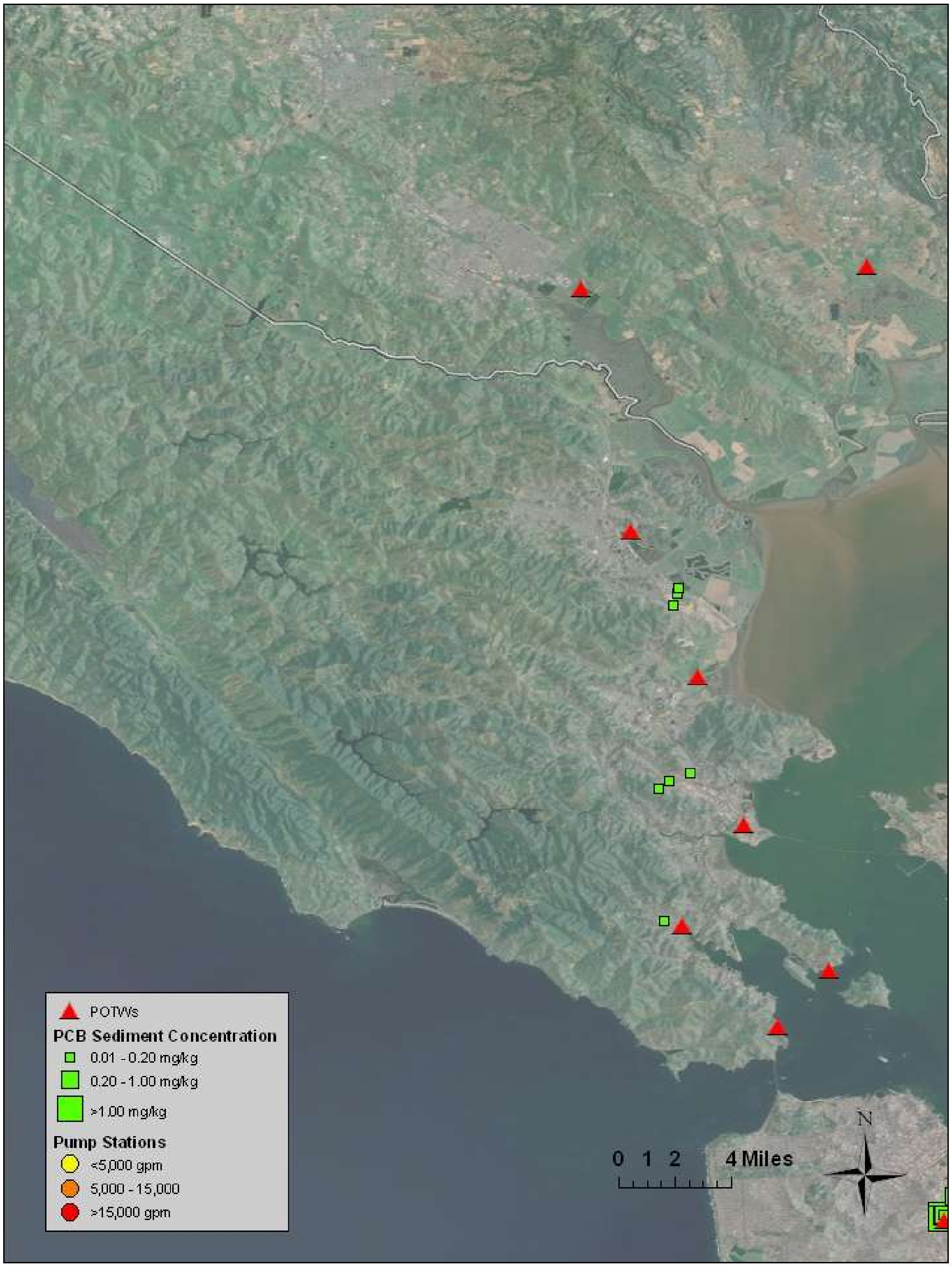

Figure 3-3. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Marin County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

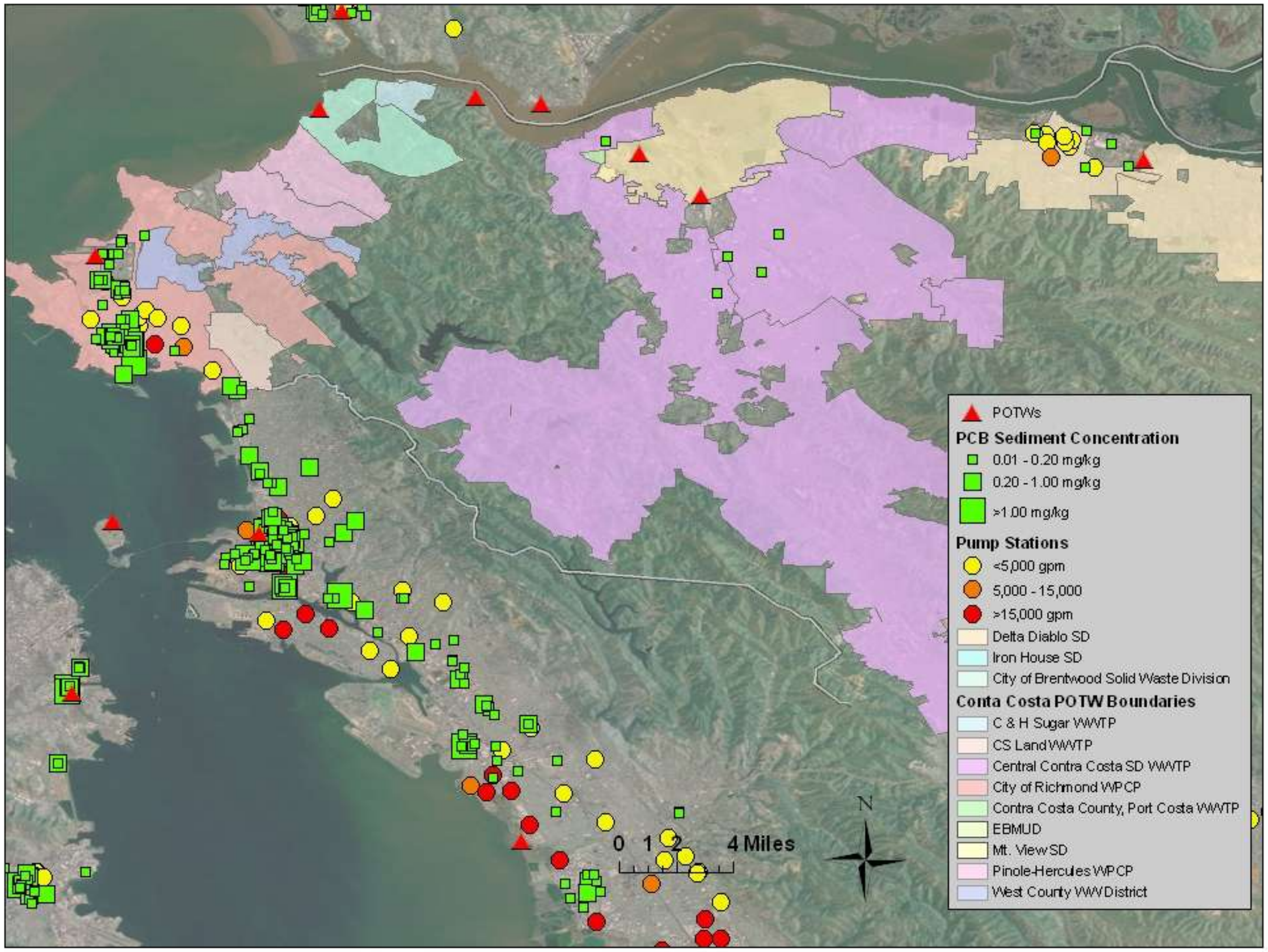

Figure 3-4. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Contra Costa County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

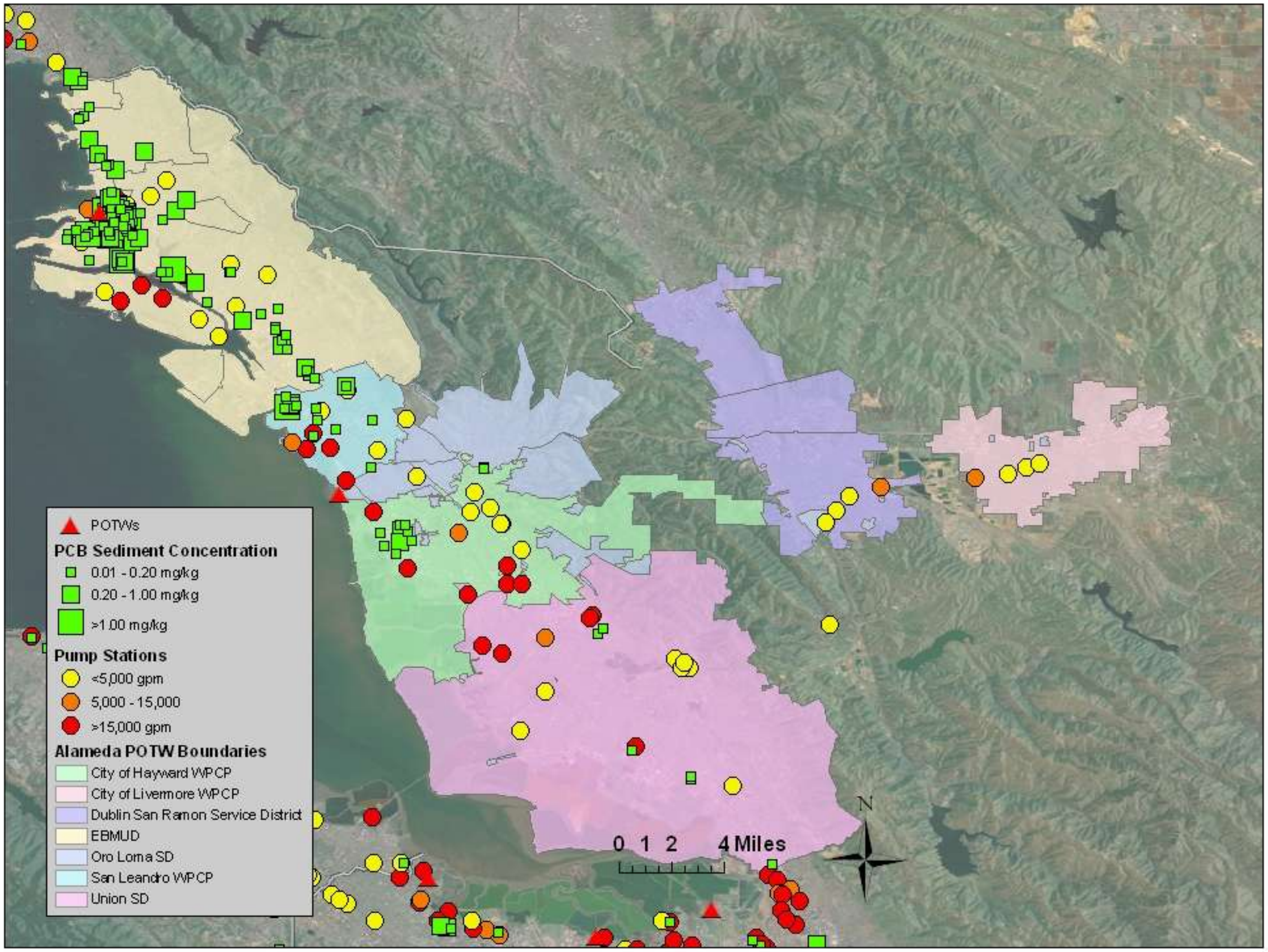

Figure 3-4. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Alameda County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

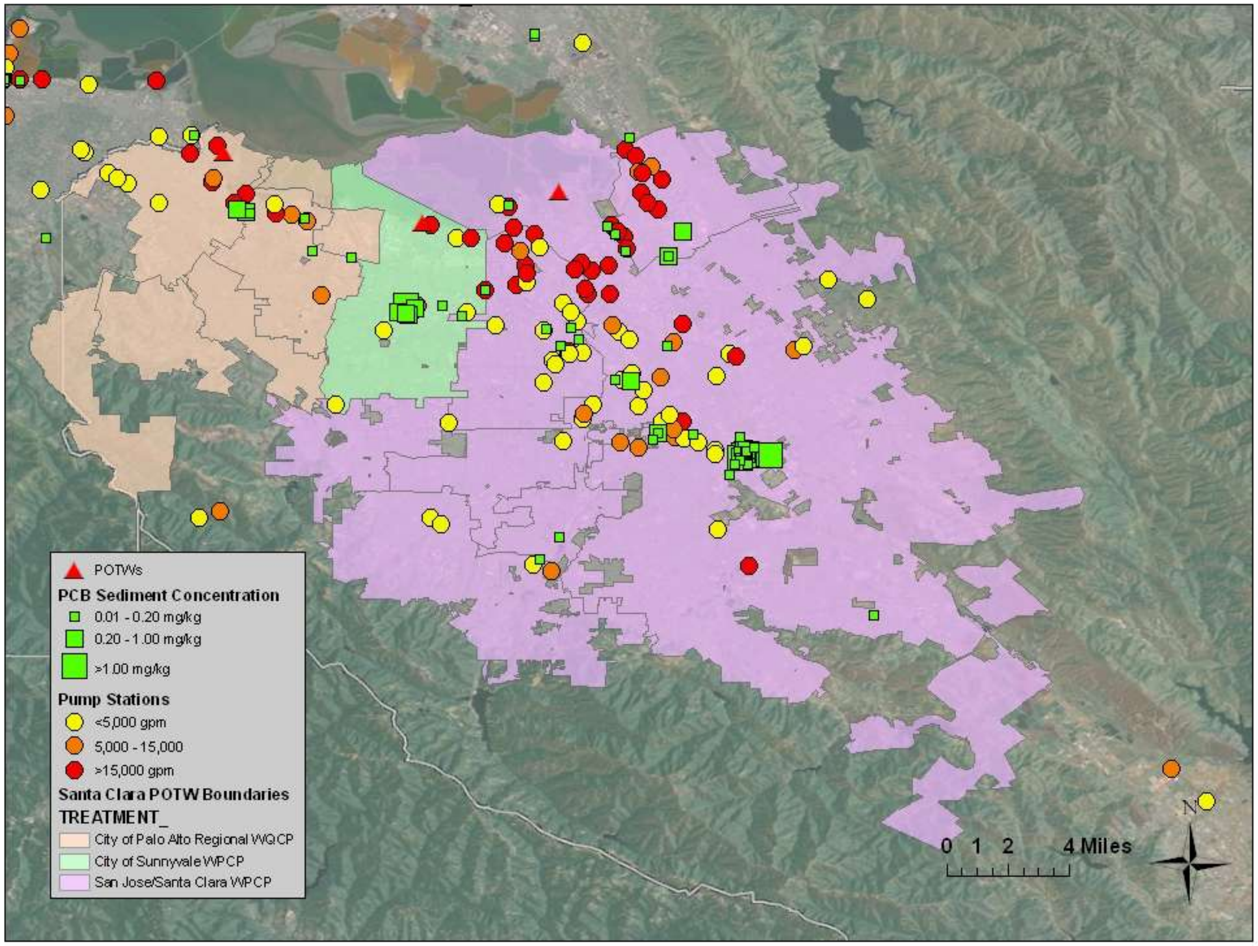

Figure 3-5. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Santa Clara County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

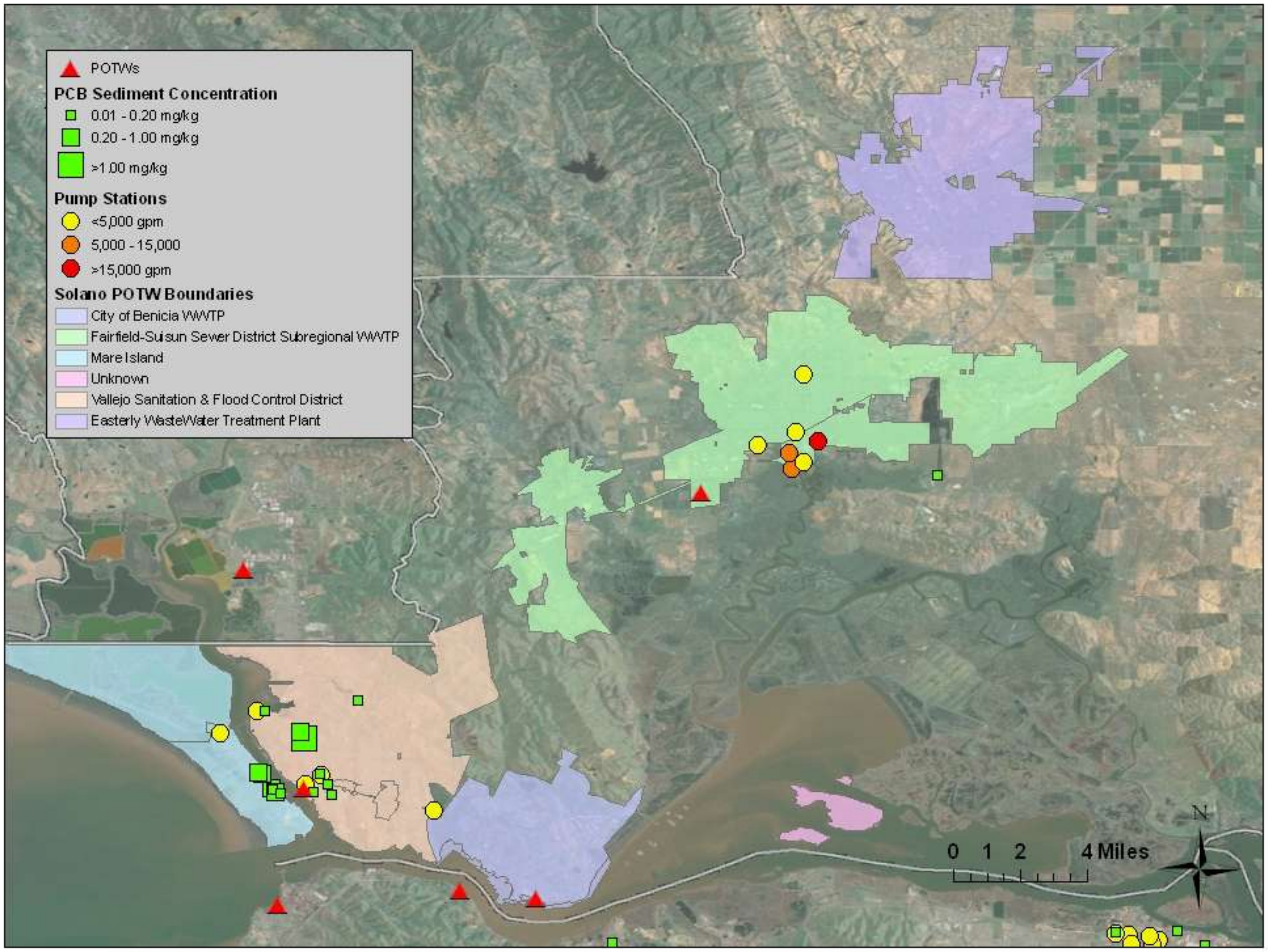

Figure 3-6. Map of Pump Station Locations, PCB concentrations in Sediments, Locations of POTWs, and POTW Service Areas in Solano County.

GIS layers for PCBs in sediments and pump stations courtesy SFEI. GIS layers for POTW service areas courtesy Caltrans District 4. All GIS information is preliminary; Brown and Caldwell and the GIS information providers make no guarantees as to the accuracy of GIS information provided in this report.

Will the project provide unique or new information? This is a more subjective question that would require input from the Technical Oversight Committee, including the SFB-RWQCB, to properly screen. It is an important question because, given the compliance time frame and inherent scale of pilot projects, they will most likely be small and temporary in nature. Therefore, in addition to targeting opportunity areas where pump stations serves drainage areas that have high PCB concentrations, pilot projects should be designed with the intent of producing information that will be useful to assess the costs and benefits of full scale implementation.

3.1.2 Costs and Alternatives

Overall cost is an important screening crtieria for pilot projects. Some simple planning tools for determining whether or not a pilot project is cost prohibitive are presented in Section 2.4.1 above. In general, pilot projects that would require significant new conveyance infrastructure or incur significant treatment costs may be less attractive than pilot projects with relatively simple diversion connections located in jurisdictions where reduced or waived treatment costs could be negotiated.

Alternatives to diversion, such as pollution prevention, street sweeping, sediment management, and stormwater treatment retrofits, should always be considered in conjunction with diversion to POTWs. This FER is developed to comply with an MRP requirement that also prescribes five pilot projects; therefore, consideration of alternatives is not a specific screening criterion for pilot projects, although it would be an important screening criteria for additional implementation beyond the pilot stage. The oversight committee will provide input and feedback on diversion sites considering the broader regional context of pilot-testing a variety of pollutant control strategies in the Bay Area.

3.1.3 Acceptability

There are two screening criteria that should be evaluated to determine whether diversion into POTWs is acceptable:

Is there an accessible POTW willing and able to provide treatment service? A key piece of information to help identify the POTW which serves an area of interest s a map of POTW service areas, such as the examples shown in Figures 3-1 through 3-9. Additionally, Pump station inventory data compiled by the SFB-RWQCB includes partial listings of the nearest POTW. The best way to assess the willingness, existing ability and challenges of a POTW to accept a diversion is to begin discussions with the appropriate staff and collectively explore opportunities and constraints of the potential diversion in question. Because of the likely change needed to existing POTW procedures, policies, and principles, it is expected that inevitably, decision makers representing the POTW will also need to be involved and approve the pilot diversion. In order for a POTW decision maker to evaluate the request, they would need certain information, including the amount to be diverted, the expected timing and duration of the pilot diversion, and the loads of PCBs, mercury, suspended sediment, dissolved solids, and biochemical oxygen demand expected. Some of the concerns of POTWs are briefly summarized in Section 3.3 below and by the Bay Area Clean Water Agencies (Carollo, 2009)

Can the pilot diversion be sited within acceptable design criteria? This criterion would be evaluated using maps, diagrams, a site walk, and other resources necessary to complete a pre-design checklist comparable to the one illustrated in Figure 2-3. A more pertinent checklist has been developed for this FER and is shown in Table 3-1.

Table 3-1. Proposed Checklist for Evaluating Engineering Feasibility of Pilot Diversions	
1	Does the POTW in question have existing capacity during wet weather?
2	Does the POTW in question have existing capacity during dry weather?
3	What is the distance to any potential sanitary sewer pilot diversion connections (linear feet)?
4	Does the potential connection require any land acquisition or easements?
5	Does the POTW fully own or control the sanitary sewer system?
6	Is the POTW willing to accept discharge from a stormwater pilot diversion project?
7	What is the capacity of the pump station (gpm)?
8	What is the wet weather capacity of the sanitary sewer system downstream of the potential pilot diversion connection?
9	What percentage of the pump station flow can be diverted to the sanitary sewer system if at all?
10	Does the pump station have sufficient area in either the wet well or after the pump to build a pilot diversion?
11	Would the pump station convey flow to the sanitary sewer system via gravity flow or an additional pump.

Questions 1 and 2 initially determine the feasibility of a POTW to accept stormwater flow. POTWs with little excess capacity will not likely take on stormwater discharges. If it is possible to divert water, questions 3, 4, and 5 consider the route necessary to convey water to the sanitary sewer system. Longer distance pilot diversions will likely be cost prohibitive, as well as routes which require acquisition of land or easements for construction. If the POTW does not own the sanitary sewer system, or shares ownership, negotiations for sanitary sewer capacity and the timing of discharges would involve more parties, and likely be more complex. Questions 6, 7, and 8 determine the capacity of the sanitary sewer system at a chosen pilot diversion point, to accept, some, all, or none of the wet or dry weather flow from the diversion. Of particular concern is whether accepting a diversion would increase the risk of a Sanitary Sewer Overflow (SSO). Finally, questions 9 and 10 determine whether the pump station itself is amenable to retrofit for pilot diversion. Pump stations in small areas with limited space for expansion would likely be ill-suited to build a flow control device for gravity flow to a sanitary sewer connection. In stations with small wet well capacity it would be difficult to install new pumps for conveyance.

Table 3-2 below summarizes the selection criteria, and the information needed to apply the criteria.

Table 3-2. Proposed Selection Criteria and Information Needed		
Criteria		Information Needed
Needs	Will the project yield a significant PCB load reduction?	PCB concentrations in sediments from the local drainage; Pump station inventories in GIS and tabular formats Event-mean PCB concentrations in stormwater; TSS and flow measurements; Drainage area assessments
	Will the project provide unique or new information?	Peer review from Technical Oversight Committee
	Does a pilot project fit into the broader regional context of pilot-testing a range of pollutant control strategies, including pollution prevention, site remediations, enhanced sediment management, and stormwater treatment retrofitting strategies?	Peer review from Technical Oversight Committee
Costs and Alternatives	Are the capital and operation and maintenance costs associated with diversion prohibitive?	Site investigations Conceptual designs and drawings Preliminary site-specific cost estimates Treatment and connection costs/charges.
	Are there ways to control upstream sources of PCBs through remediation, removal, isolation, or run-on diversion?	Source identification studies Peer review from Technical Oversight Group
	Can onsite treatment or infiltration retrofits be implemented?	Site investigations, including right-of-way mapping
Acceptability	Is there an accessible POTW willing and able to provide treatment service?	POTW service area map Communication with POTW managers
	Can the pilot diversion be sited within acceptable design criteria?	Pre-design checklist assessment (Table 1)

3.2 Cost and Benefit Analysis of Three Scenarios

This section evaluates three hypothetical scenarios to estimate the costs, grams of PCBs removed, and resulting cost per gram. These scenarios are hypothetical, based on untested assumptions and may not represent actual conditions or costs associated with stormwater pump station diversions in the Bay Area. Additionally, these scenarios are intended to only represent a range of possible costs and benefits that may be expected. Costs and benefits are evaluated in the context of three types of scenarios that are inherently different in scale and implementation timeframes. For those scenarios with longer implementation timeframes, costs can be spread out accordingly and therefore provide an unequal comparison against scenarios with shorter implementation durations. For these reasons, costs should not be used to directly compare the cost efficiencies between scenarios presented, but rather used to assess the range of costs that may be expected for an individual scenario.   Constructed Pilot Diversions

Under this scenario, it is assumed that a pilot diversion is constructed which includes operational controls that allow selective pilot diversion of first flush and wet weather events. The pilot diversion is assumed to require minimal distance to tie into the sanitary sewer system. The pilot diversion is assumed to be a gravity feed into a large capacity sewage line, requiring minimal annual O&M costs due to electricity. The receiving POTW has agreed to accept one million gallons per 24-hour storm event no more than eight times during the storm season. It is assumed, for this hypothetical scenario, that the

POTW has agreed to waive treatment fees[5]. A pilot diversion and pump system has been constructed which can convey large volumes of flow (750 gpm to deliver one million gallons in 24 hours). Based on Table 2-1, the capital outlay for this project is assumed to be $750,000. The removal effectiveness for PCBs and Hg is assumed to be >95 percent.

If the average PCB concentration in diverted stormwater were 50 ng/L, each million gallons diverted would reduce PCB loads discharged directly to the Bay by 0.2 grams (see Table 2-4). Eight such events each year would annually reduce PCB loads by 1.6 grams. Over twenty years, this would correspond to 32 grams of PCBs (assuming concentrations would remain unchanged over this timeframe).

Assuming that a ten-fold higher stormwater mercury concentration (500 ng/L), this would correspond to a load reduction of 16 grams of mercury per year, or 320 grams over twenty tears.

If the treatment plant provides treatment service for free, then achieving a total load reduction of 32 grams PCBs and 320 grams mercury over twenty years by this approach would result in a capital outlay and operation and maintenance cost of approximately $23,500 per gram of PCBs reduced, and $2,350 per gram of mercury reduced. This estimate is a very crude, demonstrative example that does not consider life-cycle costs, net present worth cost adjustments, or other complexities. The cost per gram would increase substantially if the hypothetical pilot diversion were to be terminated in less than twenty years.

3.2.1 Non-constructed Pilot Diversions

Under this scenario, it is assumed that a wet weather pilot diversion project that does not require the construction of diversion structures, but rather is implemented using check dams and pumps to divert storm flows into storage tanks, and subsequently routing into a sanitary sewer when there is sufficient capacity. Because no capital costs incurred under this scenario, municipalities diverting stormwater have less financial risk compared to the first scenario described. It is assumed that sufficient site area is available to locate ten storage tanks, and that the site area has pavement competent to withstand the weight of ten full tanks. The project is assumed to last for thirty days, and the daily cost of equipment rental and staffing is $6,000, for a total project cost of $180,000 (per Table 2-3). As with the constructed pilot diversion scenario above, treatment fees are assumed to be waived for this scenario[5]. The project is assumed to occur in the wettest months (i.e., January – February), and for the purposes of this scenario is assumed to capture a total of three major storm events, diverting a total of 600,000 gallons of wet weather flows (200,000 gallons each event) having an average PCB concentration of 50 ng/L.

Referring to Table 2-4, each 200,000 gallon pilot diversion event would capture 0.04 grams of PCBs, for a total of 0.12 grams diverted into the POTW. Again assuming 95 percent removal, this would yield a net load reduction of 0.11 grams, or 0.0006 percent of the total currently estimated PCB stormwater load. Although the total project cost is lower compared to construction of a constructed pilot diversion, the cost per gram removed is significantly higher: approximately $1,600,000 per gram of PCBs removed.

Assuming a ten-fold higher Hg concentration (500 ng/L), the net load reduction would be 1.1 grams for this scenario, at a cost of $160,000 per gram.

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[5] The simplifying assumption that a POTW waives treatment fees is, in fact, unlikely. In most cases, wastewater and stormwater programs are funded through separate sources, and so institutional factors may make such a waiver problematic. As noted in Tables 2-1 and 2-2 above, connection fees typically range from $9,000 to $18,000 per thousand gallons per day, and treatment fees typically range from $300 to $2,400 per MG treated. As a result, these cost estimates for the hypothetical scenarios are llikely underestimated. Other charges may also be assessed, such as East Bay MUD's "wastewater capacity fee" of at least $97.40 per 100 cubic feet per month, or $130,000/MG/month. See, for example: http://www.ebmud.com/our-water/wastewater-treatment/wastewater-treatment-programs/wastewater-rates-charges-and-fees

3.2.2 Conveyance System Cleanout

Under this scenario, it is assumed that a sediment sampling and visual inspection has identified a conveyance with contaminated sediments. A cleanout of the impacted portion of the system takes place over a period of seven days, at a lower cost ($4,000 per day) than the wet weather pilot diversion because the dry weather work can be more easily scheduled. A total of ten kilograms of contaminated sediments having an average PCB concentration of ten parts per million (10 mg /kg) is flushed from the system and captured in a single, 20,000 gallon storage tank, and then discharged into the sanitary sewer. Again, treatment fees are assumed to be waived for this analysis[5]. Under this scenario, the total mass of PCBs removed would be 100 mg, or 0.1 grams. If 95 percent of the PCB load discharge to the POTW is removed by treatment, the net load reduction benefit to the Bay would be 0.095 grams. The total project cost is $28,000. The cost per gram of PCBs removed under this scenario would be approximately $300,000 per gram.

Under this scenario, it is assumed that sediment with 10 mg/kg PCBs have mercury concentrations of 1 mg/kg. This assumption reflects the observations that sediments from old industrial areas that are substantially contaminated with PCB are not typically found in the same locations as sediments impacted by mining waste that have mercury concentrations of 10 mg/kg or more. The corresponding load reduction of mercury would be 0.01 grams, at a cost of $3,000,000 per gram.

Although this third scenario is the most cost-effective, in terms of cost per gram, and also one of the most likely scenarios to be acceptable to a POTW, the overall load reduction is still relatively small – again about 0.0005 percent of the total stormwater PCB load to the Bay. Additionally, this scenario (and non-constructed diversions) allow municipalities to be more adaptive in directing resources where they are most needed. This scenario could, however, be a useful diagnostic tool. If, after conducting the cleanout, follow-up inspections show that contaminated sediments are again found in the conveyance system after the rainy season ends, that would suggest a need to look upstream to possibly identify areas where sediment removal, capping, and/or run-on pilot diversion could be implemented to protect the stormwater conveyance system.

3.3 POTW and Collection System Agency Constraints/Concerns

A draft white paper developed by the Bay Area Clean Water Agencies presents a summary of constraints faced by POTWs when deciding whether or not to accept stormwater discharges for treatment (BACWA, 2009). Those issues have been raised in previous technical reports submitted to the SFB-RWQCB (e.g., Applied Marine Sciences, 2003).

Some of the main constraints faced by POTWs include:

Treatment capacity and conveyance system capacity - The BACWA (2009) white paper noted that most treatment and conveyance system capacity issues could be addressed by restricting diversion flows. Restirctions could be achieved through the design of orifices, weirs, and pumps. As noted in the cost / benefit analysis, treatment and conveyance and capacity issues may limit the load reduction benefits attainable.

Conveyance system ownership and permission of all owners - Not all POTWs own the collection and conveyance systems that serve them. If a different entity than the POTW owns the collection system, it would require another negotiation to enable the diversion. If there are multiple collection system owners, the negotiation could be more complex.

Ordinance prohibitions - The BACWA (2009) white paper notes that:

> "There are few existing agreements and local laws (e.g. ordinances) that relate to stormwater diversions, including a POTW's ability to accept, deny or condition the acceptance of stormwater diversions (e.g. flow restrictions, pretreatment requirements). Most wastewater agencies operating separate sanitary sewers currently forbid the discharge of stormwater into the sanitary system. However, many wastewater agencies have a stipulation in their rules that allow discharges to the sanitary system with the permission of the POTW."

Potential to upset biological processes, especially in advanced treatment plants. Introduction of heterogeneous surface waters puts a POTW at risk of treatment system upsets, particularly in advanced plants where inoculations of foreign bacteria can interfere with microbial communities essential to the treatment process.

Effect of PCB loads on effluent - In its report on the Ettie Street Pump Station diversion project (EBMUD, 2010), EBMUD noted that PCB loads to influent are not 100% removed by the treatment process. As a result, EBMUD stated that the compliance with respect to "PCBs and other pollutants for which the Bay is impaired would require particularly close evaluation for diversion potential." There is only a small, preliminary amount of data available on current concentrations of PCBs in treated effluent (SFRWQCB, 2008) . However, the limited amount of information available indicates that PCB concentrations in treated effluent are likely to be above water quality objectives for PCBs established in the California Toxics Rule.

Effect of PCB loads on biosolids - Initial discussions with the Technical Oversight Committee (July 14, 2010) led to the conclusion that PCB loads from pilot diversion projects may be sufficiently small that they would not significantly change the PCB concentration of biosolids. The preliminary load calculations in Section 3.2 tend to support this – conveyance system and treatment plant capacity would likely become limiting factors before PCB concentrations in biosolids would be a constraint. However, it is worth noting that deliberate introduction of PCBs into sewage treatment systems has strong potential to cause perception problems related to biosolids. For example, a recent incident in Milwaukee, Wisconsin led to the inadvertent introduction of PCB contaminated sediments in to the municipal sewage treatment system during a sanitary sewer system rehabilitation project (Behm, 2009). As a result, commercial production and sale of biosolids from the treatment plant was halted for several months. Recovery from the incident caused the Milwaukee Metropolitan Sewerage District approximately $4 million.

3.4 Conceptual Framework for Crediting PCB Load Reductions

The MRP requires that this FER include "a proposed method for distributing PCBs load reductions to participating wastewater and stormwater agencies." proposed approach for crediting mercury and PCB load reductions to POTWs. This section proposes a method for illustrative purposes, in order to comply with the NPDES permit. Any program of incentives or credits to POTWs would need to be developed with POTW involvement.

The effect of a diversion on compliance would be of particular concern. For example, in its report on the Ettie Street Pump Station pilot diversion project (EBMUD, 2010), EBMUD noted that PCB loads to influent are not 100 percent removed by the treatment process. As a result, EBMUD stated that the compliance with respect to "PCBs and other pollutants for which the Bay is impaired would require particularly close evaluation for pilot diversion potential."

There is only a small, preliminary amount of data available on current concentrations of PCBs in treated effluent (SFB-RWQCB, 2008) . However, the limited amount of information available indicates that PCB concentrations in treated effluent are likely to be above water quality objectives for PCBs established in the California Toxics Rule. The San Francisco Bay PCBs TMDL has established WLAs for PCBs in treated effluent that add up to 2 kg per year for all Bay Area wastewater dischargers combined. The estimated current loads are slightly higher, 2.3 kg per year. The SFB-RWQCB has stated that it expects PCB concentrations in effluent to decrease over time as a result of the fact that PCBs are no longer manufactured or used. Recognizing that pilot diversion projects would increase PCB loads to POTWs, the SFB-RWQCB also included a 1 kg per year WLA to be made available to individual POTWs who agree to accept stormwater for discharge.

IN the staff report accompanying the San Francisco Bay PCBs TMDL, the explanation for the 1 kg per year WLA available for stormwater treatment is as follows:

> "A potential means to reduce urban stormwater runoff PCBs loads will be to strategically intercept and route runoff to municipal wastewater treatment systems. We propose a separate wasteload allocation for discharges associated with urban stormwater runoff treatment via municipal wastewater treatment systems, since such actions will result in increased PCBs loads from municipal wastewater dischargers, and the proposed individual wasteload allocations for municipal wastewater dischargers reflect current performance levels. We propose a wasteload allocation of 0.9 kg/yr, which is the difference between the TMDL of 10 kg/yr and the sum of the other proposed wasteload and load allocations."

The proposed method is to credit the participating stormwater permittee for the estimated load diverted as progress towards attainment of the TMDL wasteload allocation. Participating POTWs would likely seek some form of regulatory protection from effluent limit exceedances or system upsets caused by the pilot diversions. The SFB-RWQCB could consider offering some of the 1 kg per year WLA as an incentive for POTW participation. A crediting ratio could be proposed to allow a small increase in POTW loads in comparison to the stormwater loads removed. For example, if the crediting ratio were 10:1, then the 1.6 grams of PCBs removed annually under Scenario 1 above would allow the participating POTW to increase loads by 0.16 grams per year. A crediting ratio of 10:1 would allow for a 90 percent removal efficiency by the POTW: for every ten additional grams of PCBs in stormwater treated by the POTW, an addtiional one tenth of a gram would be discharged, resulting in a net PCB load reduction. The SFB-RWQCB would likely need to seek input and buy-in on this concept from the United States Environmental Protection Agency, as well as local environmental stakeholders, to incorporate this or any other crediting framework into NPDES permits.

Section 4

Process and Schedule for Pilot Project Implementation

A proposed timeline for pilot project implementation is shown in Table 4-1 below. This FER completes Task 1, which is led by a BASMAA as a regional project. Task 2.0 will begin upon submittal of this FER. Copermittees, with some assistance from BASMAA as needed, would use this report to propose five candidate and five alternate pump stations for pilot projects. A technical memorandum summarizing the candidate and alternate pump stations would be submitted to the SFB-RWQCB by September 15, 2011. After that time, preliminary designs and cost estimates for the pilot diversions would be advanced.

Sampling and analysis plans would be developed though a regional project. Progress would be summarized in Annual Reports submitted by BASMAA to the SFB-RWQCB. The MRP requires a final report to be completed by March 15, 2014.

Table 4-1. Proposed Schedule for Pilot Project Implementation

Task	Programs/ Permittees	Regional	Suggested Start Date	Suggested End Date
1.0 – Feasibility Evaluation				
1.1. Develop draft list of criteria that should be considered when selecting areas or stormwater pump stations for potential pilot diversions to POTWs, and associated data/information needed to apply the criteria.	A	X	May 15, 2010	July 21, 2010
1.2 Develop a preliminary cost and benefit assessment for three (?) types/configurations of areas or pump stations using existing data and information	A	X		
1.3 Develop draft methodologies for distributing loads between POTWs and stormwater programs when diverting areas or pump station discharges to POTWs.	A	X		
1.4 Summarize criteria, cost benefit analysis, and loads methodology in a report and include a time schedule for selection and implementation of pilot diversions.	A	X		Draft – August 11, 2010 Final – September 15, 2010
2. 0 Pump Station Retrofits				
2.1 Apply criteria developed in Task 1.1 and select a minimum of 5 primary and 5 alternate pump stations or areas (2 per county) that will be considered for pilot diversion.	X	A	September 8, 2010	February 28, 2011
2.2. Develop memorandum summarizing pump stations or areas selected in task 2.1 above and a refined cost benefit assessment for these pump stations or areas.	A	X	March 1, 2011	Draft – May 15, 2011; Final – August 15, 2011
2.3 Further scope pilot diversion infrastructure needs, and develop preliminary/conceptual design (5 percent) and engineering for pump stations or areas selected in Task 2.1.	X	A	June 1, 2011	December 1, 2011
2.4 Refine conceptual design into 30 percent level of design and acquire permits/agreements as needed.	X	A	December 1, 2011	December 11, 2012
2.5 Retrofit existing pump stations or areas to allow for pilot diversion to POTW (i.e., construction) under predefined conditions	X	A	January 21, 2013	June 1, 2013
3.0 Monitoring				
3.1 Develop regional sampling and analysis plan (Including a QAPP and SOP) and data reporting templates	A	X	July 1, 2011	June 30, 2013
3.2 Monitor diversions (early implementation may be possible at some stations)	X	A	July 1, 2013	January 31, 2014
3.3 Conduct QA/QC, data analyses	A	X	July 1, 2013	February 28, 2014
4.0 Reporting				
4.1 Summarize pilot diversion project status/progress in Annual Report	X	A	July 1, 2010	September 15, 2014
4.2 Prepare summary report for inclusion in integrated report	A	X	January 2, 2014	March 15, 2014

Notes: A = Assist; X = Task Lead. Monitoring results produced after December 1, 2013 may not appear in the March 15, 2014 Integrated Report submittal.

Section 5

Limitations

This document was prepared solely for the BASMAA in accordance with professional standards at the time the services were performed and in accordance with the contract between BASMAA and Brown and Caldwell dated June 3, 2010. This document is governed by the specific scope of work authorized by BASMAA; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by BASMAA and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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Attachment 1. List of Major POTWs in the Bay Area

NPDES Permit	POTW	Area	Outfall	Agencies	Service Population	Dry Weather Design Flow (mgd)	Biosolids Disposal Methods
CA0038318	SF International Airport Mel Leong Treatment Plant	San Mateo County	NBSU	SF International Airport	Commercial Airport	2.20	Landfill
CA0038130	Cities of South San Francisco and San Bruno WQCP	San Mateo County	NBSU	City of S. San Francisco, San Bruno, Daly City, Colma	106,000	13.00	Landfill
CA0038369	South Bayside System Authority WWTP	San Mateo County	Same	West Bay Sanitary District, City of Belmont, San Carlos, Redwood City, Woodside and San Mateo County	217,000	29 mgd	Landfill
CA0037532	City of Millbrae WPCP	San Mateo County	NBSU	City of Millbrae	22,000	3.00	Landfill/Land Application
CA0037788	City of Burlingame WWTF	San Mateo County	NBSU	Burlingame, Hillsborough, San Mateo County	37,000	5.50	Landfill/Land Application
CA0037541	San Mateo WWTP	San Mateo County	Same	City of San Mateo, Foster City, Hillsborough, Belmont; San Mateo County	137,000	15.70	NA
CA0037613	Dublin/San Ramon Services District	Alameda County	LAVWMA/EBDA	DSRSD, City of Pleasanton	NA	17.00	NA
CA0038008	Union Sanitary District Alvarado WWTP	Alameda County	EBDA	City of Fremont, Newark, Union City	320,000	33.00	Landfill
CA0038008	Livermore WRP	Alameda County	LAVWMA/EBDA	City of Livermore, Ruby Hill (Pleasanton)	NA	8.50	Landfill/Land Application
CA0037869	Hayward WPCF	Alameda County	EBDA	City of Hayward	140,000	16.50	Landfill/Land Application
CA0037869	San Leandro WPCP	Alameda County	EBDA	City of San Leandro	50,000	7.60	Landfill
CA0037869	Oro Loma/Castro Valley Sanitary Districts WPCP	Alameda County	EBDA	San Lorenzo, Ashland, Cherryland, Fairview, Castro Valley; City of San Leandro and Hayward	126,000	14.90	Landfill
CA0037702	EBMUD WPCP	Alameda County	Same	City of Albany, Alameda, Berkeley, Emeryville, Oakland, Piedmont; Stege Sanitary District	636,635	120.00	Landfill/Land Application
CA0037834	Palo Alto Regional WQCP	Santa Clara County	Same	City of Los Altos, Los Altos Hills, Palo Alto, Mountain View, East Palo Sanitary District; Stanford University	228,500	39.00	Incineration

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NPDES Permit	POTW	Area	Outfall	Agencies	Service Population	Dry Weather Design Flow (mgd)	Biosolids Disposal Methods
CA0037842	San Jose/Santa Clara WPCP	Santa Clara County	Same	City of San Jose, Santa Clara, Milpitas; SCC CSD No. 2 and 3; WVSD, Campbell Los Gatos, Monte Sereno, Saratoga; and Cupertino, Burbank and Sunol Sanitary Districts	1,365,000	167.00	Landfill/Land Application
CA0037621	Sunnyvale WPCP	Santa Clara County	Same	City of Sunnyvale, Rancho Rinconada, Moffett Field	136,000	29.50	Landfill/Land Application
	South County RWWT Authority	Santa Clara County					
CA0037826	Rodeo Sanitary District WPCF	Contra Costa County	Same	City of Rodeo and Tormey	NA	1.14	NA
CA0037648	Central Contra Costa Sanitary District WWTP	Contra Costa County	Same	Contra Costa County	445,000	53.80	NA
CA0038539	West County Wastewater District Treatment Plant	Contra Costa County	West County Agency (WCA) Common Outfall	City of Richmond, San Pablo, Tara Hills, Rollingwood, Bayview, El Sobrante, Pinole, CC County	90,000	12.50	NA
CA0037796	Pinole/Hercules WPCP	Contra Costa County	Rodeo Sanitation District	City of Pinole and Hercules	NA	4.06	Landfill
CA0005240	C&H Sugar WWTP	Contra Costa County	Same	C&H Sugar, Crockett Community Services District	NA	0.30	Off-site disposal
CA0038539	Richmond Municipal Sewer District WPCP	Contra Costa County	West County Agency (WCA) Common Outfall	City of Richmond, Richmond Municipal Sewer District No. 1	68,000	16.00	NA
CA0037770	Mt. View Sanitary District WWTP	Contra Costa County	Same	Mt. View Sanitary District	25,000	3.20	NA
CA0038547	Delta Diablo Santitation District WWTP	Contra Costa County	Same	Pittsburg, Antioch, Baypoint	189,000	16.50	Landfill/Land Application
CA0037885	Port Costa WWTP	Contra Costa County	Same	Port Costa	182	0.03	CCCSD
CA0038024	Fairfield-Suisun Sewer District WWTP	Solano County	Same	City of Fairfield, City of Suisun, Solano County	132,500	17.5	Landfill/Land Application
CA0037699	Vallejo Sanitation and Flood Control District WWTP	Solano County	Same	NA	NA	15.50	NA